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Computer Age

OCTOBER 1980

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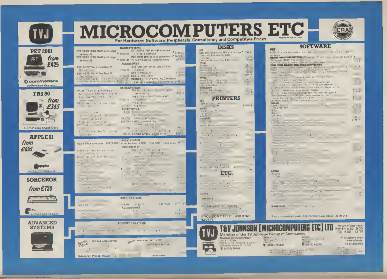

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Cover The Searcher Falls
by Teoman Irmak

Editorial

What's The Point?

A friend who teaches computing at a new centre for young people turned round to me the other day and said "I've come to the conclusion that all this talk about computers and silicon chips is a load of [illegible]"

He is not alone in that view. The reaction is setting in to an extreme. Apart from some clever games (and many more boring ones) the impact of the "silicon chip" doesn't really tell in the public mind with the media hype. On the other hand there are conflicting views on its impact on employment, and as far as ways of dealing with its consequences is concerned the public is getting tired of stereotyped variations on a depressing theme.

But facts, however familiar and contemptible they have become, will not go away. As always happens, any human activity attracts commentators, critics, ersatz philosophers, genuine thinkers. In short an industry of words. The saying goes "those who can, do; those who can't, teach". It can be revamped as "those who know, apply; those who don't, hype". So it is that there are thousands who are using computers as tools, finding new applications and improving old ones, ignoring the excited optimists on one side and the knee-jerk doom sayers on the other. But the very people who do are in danger of regarding computing as an end in itself and, [illegible] though it may seem, need to be aware of the larger scene. To this end it is a duty to read about viewpoints put forward by people, however radical and contentious they may be, who have themselves thought their positions through. There are genuine thinkers around.

Sperry Corporation held a four day conference at Nice last August. The subject was decision making and the computer. The audience at the seminars comprised computer journalists and technology correspondents. The speakers included an adviser to the Prime Minister and Sperry's [illegible] featured guest. The only serious omission was that of a trade union representative. Speaker after speaker got up to say that at the highest levels of decision-making no thing could replace the human being.

But things that human beings make can destroy human beings.

Meyer N Solomon
Editor

The Searcher

Robots in Industry

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CHILDREN WITH A HAMMER

OR, VIEWING THE WORLD AS A NAIL

Those concerned with the cultural political and social development of society increasingly view with alarm the fanatical missionary zeal of the computercrats.

Armed with a childlike boy-scout optimism about technology, and usually unknowingly guided by the divine canons of profit maximisation of their multinational paymasters, these industrial Eichmen ("I only did what I was told") blandly supercharge the vehicle of technological change on its exponential way.

Remarkably oblivious to the consequences of their work, they ensure that anything which can possibly be computerised will be computerised. They are, as that brilliant and concerned professor of computer science at MIT, Josef Weizenbaum, so succinctly put it, 'Like children with a hammer, they view the world as a nail'. History is for them alas something you repeat rather than learn from. Thus they are quite happily beginning to repeat in the field of white collar, intellectual, conceptual work, and in the so-called new jobs, most of the mistakes we already made at such enormous cost at earlier historical stages, when skilled manual work was subjected to technological change.

For the technocrats, however, this is a non question. Computerisation is part of technological progress and technological progress is by definition "good". The nature and form of that progress and alternative forms of progress are not matters open to discussion. If really pressed to justify what they are doing, they will assert that automation, computerisation and the use of robotic devices and microprocessors, will free human beings from soul-destroying, routine, back breaking tasks, and leave them free to engage in more creative work.

These systems, they suggest, will lead to a shorter working week, longer holidays and more leisure time. They will, in a word, improve the *quality* of our working lives. Pressed further, they may add – as a sort of occupational bonus – that the masses of data available to us through information retrieval systems will mean that the decisions we make will be that much more logical, scientific and creative.

Mike Cooley [illegible] unionist, a researcher and co-Director of the Centre for Alternative Industrial and Technological Systems

To argue thus is to ignore the growing chasm between that which technology *could* provide (its potential) and that which it actually does provide (its reality).

Let us then look briefly at some of the realities. There is now a growing use of NC (numerical control) machine tools in the manufacturing industries. In consequence of this, some of the most highly skilled and satisfying jobs are being destroyed. Activities such as jig boring, universal milling, turning and grinding are being permanently eliminated by these new systems.

The industrial sociologists used to assure us that the jobs created by the new technologies would in fact elevate the worker to a sort of manager of the system. That is to say, the computer would give the worker an overview of the activity and would be a form of occupational aperture through which he could see the previously fragmented parts of the labour process in a new whole, with the computer acting as the integrator.

In fact, the new functions which emerge on the shop floor are deskilled, and so organised that the worker is controlled by the machine and the system rather than the other way round. This has reached such a state that in the July '79 issue of the *American Machinist* it was pointed out that for some forms of numerically controlled machine tool work, the ideal workers are mentally retarded adults, and it mentioned a mental age of twelve.

Had the objective been to provide work for the mentally handicapped, this clearly would have been laudable, but what must be of long term concern to all of us is that some highly skilled work, through which workers acquire that precious tacit knowledge that Polanyi used to talk about, is being eliminated. This raises serious questions as to where the next generations of skill are going to come from.

When these problems are pointed out to the computercrats it is sometimes grudgingly admitted that there may indeed be a problem in the field of manual work, but at least the white collar jobs emerging will be more enriching and creative.

This is also without foundation, since the systems are introduced within the framework of "Scientific Management". The founder of scientific management, Frederick Taylor, once pointed out: "In my system, the workman is told precisely what he is to do and how he is to do it and any improvement he makes upon the instructions given to him is fatal to success."

This was said in respect of manual work. It should, however, not be forgotten that the father of computerisation, Charles Babbage, anticipated Taylor in the 1830s when he said: "We may have already mentioned what may perhaps appear paradoxical to some of our readers, that the division of labour can be applied with equal success to mental as well as mecha

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nical operations and that it ensures in [illegible] the same economy of time.”

The division of labour is now progressing apace in the field of white collar and intellectual work and computers are being used as a Trojan Horse for its introduction. The problems exist right through the spectrum of intellectual work from comparatively routine clerical tasks, to the highest level of intellectual activity. A major research project examining the impact of computerisation on those working in banks in Sweden, concluded, “Increased automation converted tellers, who were in effect mini bankers, into automatons.”

The optimum straitjacket

At the other end of the creative spectrum, those engaged in architecture – “the queen of the arts rather than the father of technology” – are likewise deskilled. Architects using interactive graphic systems with packages such as HARNESS are confronted with a systematised approach to the design of building in which they are required to use a number of predetermined architectural elements. They are thus reduced to using a sophisticated LEGO set and their creativity is limited to choosing how the elements might be disposed by shifting them around a VDU screen. The elements themselves cannot be changed. They have been optimised!

It might be argued, in defence of these developments, that at least in the “occupational growth areas” associated with computing, those workers concerned with issuing instructions to the machines will be undertaking work of growing skill and creativity. To suggest this would be to fail completely to understand the historical tendency to deskill *all* work. Programming itself is being reduced to routines and, as Philip Kraft shows in his book ‘Programs and Managers – The Routinization of Computer Programming in the United States’, the deskiller is himself deskilled as structural programming breaks with the universal (if short) tradition of idiosyncratic software production.

The computer is not only used as a Trojan Horse for Taylorism in the fields of management and scientific work. Even the university is no longer a sanctuary for non-alienated work. Those academics engaged in the physical and pure sciences will be pleased to learn that these important issues of efficiency and optimisation will not be left to the subjective ramblings of the sociologist or the tainted ideology of the political economist. The full analytical power and neutrality of real science, and the penetrating logic of mathematical method have been brought to bear on them. They will undoubtedly produce a completely objective solution to the problem of university efficiency.

For example, the notion of utilising factory models to optimise university and polytechnic productivity has been seriously proposed. We now have the rather ironic development in which some of those who at university helped to develop the scientific management production systems which made work so grotesque for those on the shop floor may soon be the victims of their own repressive techniques. An article entitled “College of Business Administration as a Production System” reported in the Academy of Management Journal, is symptomatic of the general tendency. This article employs the terminology used to describe academic features and activities in the form of a factory model. It is strongly indicative of the underlying philosophy.

Thus, the recruitment of students is referred to as “material procurement”, recruiting of faculty as “resource planning and development”, faculty research and study as “supplies procurement”, instructional methods planning as “process planning”, examinations and award of credits as “quality control”, instructor evaluation as “resource maintenance”, and graduation as “delivery”. The professors and lecturers are of course “operators” and presumably, as on the factory floor, only the effective operators will be tolerated. (Effective for what and for whom, we may ask.)

> *‘In my system, the workman is told precisely what he is to do and how he is to do it and any improvement he makes upon the instructions given to him is fatal to success’*

The administrators’ definition of effectiveness and competence makes it highly likely that many of the cherished academic freedoms of the university, whether real or imaginary, will be dented. In the not too distant future, many faculty members may well find themselves subordinated to the process in the interests of efficiency as are workers on the shop floor.

To get down to the real ‘science’ of it we can look at the proposals of Geoffrion, Dyer and Frieberg in “An Interactive Approach of Multicriterion Optimisation with an Application to the Operation of an Academic Department”. They use the well known *Frank Wolfe* algorithm and suggest that the multicriterion problem be reduced to the following expression.

Maximise $U[f_1(x), f_2(x), \ldots, f_r(x)]$ subject to $x \in E$ where $f_1, \ldots, f_r$ are r distinct criterion functions of the decision vector x, X is the constrained set of feasible decisions, and U is the decision-maker’s overall preference function defined on the values of criteria.

Taking a specific department as an example, they define six criteria for it. The first three are the number of course sections offered by the department at graduate, lower division undergraduate and upper division undergraduate levels. Criterion four is the amount of teaching assistant time used for the support of classroom instruction by the faculty. The fifth criterion is the regular faculty effort devoted to major departmental duties measured in equivalent course sections. Finally, criterion six is the regular faculty effort devoted to additional activities such as research, student counselling and minor administrative tasks, again measured in course sections.

Terms such as ‘teaching time’, ‘teaching loads’ and ‘faculty effort’ are used throughout. This will mean that whoever makes a decision about criterion weight must have very precise times for the different functions, and thus the basis is clearly set for work measurement not unlike that on the shop floor. The justification will no doubt be that such times are necessary to be fed into the computerised model for objective assessment.

However, despite the veneer of mathematical objectivity, it is the subjective judgement of the so called decision-maker that determines the key U function. This decision-maker will be an administrator, not the academic staff themselves, who will consequently experience a loss of control over their work environment. If, for example, a faculty member is informed via the computer that he or she is taking too long on teaching, or spending too much time in research, or has been rendered superfluous as a result of an optimisation routine (a function which mathematically illiterate workers call ‘the sack’) it will be worth recalling that it is the U function that predominates!

We really should not be surprised that this is how computer systems are being used, or this is what they are doing to human beings. These are precisely the objectives of the vast multinational corporations. Indeed, in some unguarded moments the captains of these corporations are remarkably frank about the political nature of these new technologies. Thus Franco di Benedetti, Joint Managing Director of Olivetti, said recently of new technology: “It is basically a technology of co-ordination and control over a workforce – the white-collar workers – which (traditionally) organisation does not cover. In this sense EDP (electronic data processing) is in fact an organisational technology, end like the organisation of labour, has a dual function as a productive force and as a control tool for capital.”

The name of the game

The use of new technologies in this form has correctly been described by the United Autoworkers Union researcher Harley Shaiken as ‘Power masquerading as Technology’.

I have described elsewhere how it would be possible to design systems which would enhance the skill of human beings and be liberatory in their application. Whether we design systems in that way or not is a profoundly political question. As we design machines and systems we are in fact designing social relationships.

There are other possibilities open to us. In the case of manual work, and specifical

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Alternative View

ly relating to NC equipment there exists the possibility of systems developed by David Gossard of the MIT known as Analogical Part Programming (1)

I and my colleagues at Lucas Aerospace have proposed devices called 'telecharic These devices mimic in real time the actions of a skilled craftsman They respond to the intelligence of the craftsman and do not control him 'Telecharic means hands at a distance

In the field of intellectual work Howard Rosenbrock of UMIST has demonstrated the first human-enhancing alternative, by developing a CAD (computer aided design) system which accepts the skill and knowledge of the designers and gives them improved techniques and facilities for exercising *their* knowledge and skill The outcome of his work does demonstrate in embryo that there are other alternatives if we are prepared to explore them and he has suggested that we are now at a unique historical turning point where we may well close off options that are still open to us This process he has described as the 'Lushai Hills Effect'

These examples demonstrate that it is possible to so design systems as to enhance human beings rather than to diminish them and subordinate them to the machine It is my view that systems of this kind, however desirable they may be will not be developed and widely applied since they challenge power structures in society Those who have power in society epitomised by the vast multinational corporations are concerned with extending their power and gaining control over human beings rather than with liberating them Such a viewpoint may appear abnormally sectarian or political to some readers yet they only have to look at the headlines of the technical press to see statements which completely reinforce that analysis Thus recently a headline in the *Engineer* stated 'People are trouble but Machines obey and even in economic papers one finds headlines such as "Robots didn't strike"

'there are other alternatives if we are prepared to explore them'

It is not suggested here that engineers who design conventional systems are hideous fascists who deliberately engage in this design in order to subordinate others to the control of the machine and the organisations that own the machine What I am suggesting however is that they are dangerously mistaken in regarding their work as being neutral Such a naive view was ruthlessly exploited in the Third Reich as Albert Speer pointed out in his book Inside the Third Reich B[illegible] exploited the phenomenon of the [illegible] often blind devotion to his task [illegible] of what appeared to be the [illegible] neutrality of technology these people were without any scruples about their [illegible]

Science and technology are not neutral and we must at all times expose their underlying assumptions We can at the same time begin to indicate how science and technology might be applied in the interests of the people as a whole rather than to maximise profits for the few

The alternatives are stark Either we will have a future in which human beings are reduced to a sort of bee like behaviour reacting to the systems and equipment specified for them, or we will have a future in which masses of people conscious of their skills and abilities in both a political and technical sense decide that they are going to be the architects of a new form of technological development which will enhance human creativity and mean more freedom of choice and expression rather than less The truth is we shall have to make the profound political decision as to whether we intend to act as architects or behave like bees ■

● Mike Cooley will in a future issue expand on some of the alternatives sketched in this article

Reference

(1) "Architect or Bee? The Human/Technology Relationship by Mike Cooley Published by Langley Technical Services 95 Sussex Place Slough SL1 1NN

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THE HANDICAPPED

The biggest handicap of being handicapped is the difficulty of fitting 'into' society: fitting socially, communicating and mingling with one's fellows; and fitting economically, taking one's place as an intelligent human being quite able to earn a living once over the handicaps of difficulty in moving (eg making one's fingers do such elementary things as write, in walking, or even in breathing). Then the difficulties of communication by speech, sight and touch and – for that matter – by other means of communication, the so-called "body language" which the non-disabled take for granted.

Most physical handicaps result from some or other failure in the system by which the brain controls the muscles and the muscles the body in general. It is here that the micro-computer really comes to our aid. One of the most complex research programs I have come across puts a microcomputer onto the arm of a spastic, wiring it to the nerves that carry to the arm and hand muscles instructions to move the hand, say, from A to B. In a spastic, such messages would normally get scrambled and instruct the muscles to cause movement from A to C. But the micro was programmed to interpret the messages from the brain, which it had intercepted, and to translate them so that they would be sent to the correct place and cause the desired movement to be made.

Or take the less (but still very) complex piece of programming by which a man without throat muscles, and therefore speechless, was fitted with a microcomputer to respond to various pressures from tongue and cheeks. The pressures caused the emission of noises sufficiently like speech to be understood, so that he could once again talk! These are, perhaps, exceptional applications, but they are only two of many of varying degrees of complexity. All over the country, indeed all over the world, people are working on such devices. *And for the most part they are working in isolation.*

Very few people produce devices which are used beyond the group or even the person for whose use they were originally designed. Not because these aids are too specific to be generally useful, not because they are too expensive to make, not because they are protected by patent – but simply because these people just do not know about each other.

How often has the wheel been reinvented simply because the second inventor never knew about the first. This is happening again and again in the field of what, for want of a better expression, I have christened "disability technology". Something must be done to establish a central bank of information at which such workers can enquire and through which they can exchange knowledge. Nor, of course, are they the only ones to whom such a means of information exchange is important. The disabled themselves need to have ready access to information about all the means becoming open to them; their advisors, financial as well as therapeutic, need to know what can be done and at what expense. There are increasing numbers disabled by accident (often road accident) and claiming damages in respect of their new disability, who need to know what is available and at what cost, as do their legal advisers.

Underware

Information Retrieval is becoming a leading pre-occupation of computer application designers, and in it there is, I am sure, a tool for helping this *flow of ideas* on disability technology.

There are, in fact, two principal fields of information technology development. First, the hard- and soft-ware for storing and accessing large databases; second, the techniques by which enquiries may be defined and addressed to the database (techniques defined many years ago by one of the innovators in this field as "our underware"). On the one hand you have a collection of entities, for each of which is given a list of characteristics, and on the other hand an enquiry for entities which have characteristics A, B and C. *Matching* the two produces a list of things matching the enquirer's needs. Information Retrieval can only be really effective when the database is sufficiently *large* (in terms of the number of entities it handles) and sufficiently *well-organised* (in terms of the descriptions of them) for the two to be efficiently matched.

There is a number of databases handling information related to the medical aspects of disability, but they do not provide sufficient information about aids for specific handicaps.

Two big international services, Excerpta Medica and Index Medicus, seldom concern themselves with physical aids for the handicapped and, indeed, this is understandable.

The INSPEC information base handles all literature on electrical and electronic literature and this has provided a slightly longer list of references in a search financed by the British Computer Society (Committee for the Disabled). But there is increasing awareness among all workers in the field that some centralised pool of information is needed. It is in building this pool that we are appealing to *Computer Age* readers for help.

Could every one among you who is working on the development of a device or devices please let us know what you are doing and why – in other words, the disabilities you are seeking to help and the tools you are devising for helping. And can you put us in touch with others who might provide useful information?

Nor do we only need help from the designers of future aids; information about what aids are actually available now is quite as important, whether commercially or as one-off production.

Of course, not all the aids are unseen and unsung. There is already a number of devices on the market, like the IBM talking typewriter (for blind or partially sighted typists) using a magnetic voice synthesiser to read back the words typed, spelling them if wished, and accepting corrections for the final copy – even giving, when asked, information about position on the page. The "Possum", a typewriter for the severely disabled, is the foundation for a number of more specialised applications. A device is now being developed to help people with severe speech problems and also those with a very limited limb movement which makes writing impossible. The machine can "hear" and learn the few distinct speech sounds that can be enunciated and, with these stored in its memory and each attributed to a number (at present 1, 2 or 3 only), the user can "grunt" the numeric codes and phrases. These can in turn be displayed on an attached VDU, through which he or she can therefore communicate with the rest of the world.

The British Computer Society

The British Computer Society has itself, through its Committee for the Disabled, developed the aid known as MATE, Memory Assisted Terminal Equipment. This is a light touch terminal with Shift and Control Keys locking for one character; when they are pressed, a light identifies the mode presently operating. The user can print a word and, when he or she is satisfied with its corrections, can send it to the computer.

Just what aids are now available? And

[illegible] being developed? And are needed but not being developed? And who has the expertise to help for instance some[illegible] developing a device to operate a [illegible]der when neither sight nor movement in the rest of the body can be used? Information to answer questions such as these must be gathered into a central information store and I appeal now to all who have any relevant information to contribute it immediately.

One of the difficulties in operating such an information centre will be that those who have spent a lot of time and money developing an aid will not give away information (which after all could be patented) exploitable by others. It may seem short sighted to limit information exchange for this reason but there are people and organizations who might gladly capitalise on ideas they could steal from the information base. Nearly every one developing an aid would be glad to give comment and advice to others working for the relief of suffering but would not want to find that his or her ideas had been "pinched" as money-spinners for people not primarily concerned with the disability itself. For this reason it is now proposed that where a match is found between an enquiry and information on the database only the name of the worker mentioned in the retrieved record will be output unless he has already agreed to the information itself being distributed.

Another difficulty will be in keeping up with developments. Since only a small proportion are reported in the literature the *developers themselves* will have to feed the database. With any luck once the information centre idea has started it will be self-perpetuating.

Nor is information to be expected to come only from this country or to be used here only. Throughout the industrial world technology can be – is being – harnessed for aids to the disabled and the database will have to try to cover developments all over the world and be hospitable to enquiries from all over the world. Already I have initiated contacts throughout the English speaking world and have begun to get some feedback. There has just come to hand for instance a report of the Faculty of Education Computer Applications Unit of the University of Calgary Canada describing the development and use of multi media terminals. These are special input devices enabling the handicapped to communicate more easily with the computer and concept keyboards to assist the retarded by reducing the amount of mental coding required. They can aid both the physically and the mentally handicapped (the latter as a result of his or her misfortune often being physically handicapped also).

From Australia comes news of the development of a micro fiche reader for the disabled enabling the pages to be turned by a remote press button operation. This is seen as particularly useful to the bed bound and to all with limited manual dexterity. It is also of increasing use by the partially blind, experiment with coloured fiche and different coloured filters has en[illegible]

Viewpoint

abled [illegible] with so called tunnel vision [illegible] able to read only braille – to obtain a [illegible] word span using red fiches. Further developments planned include the commercial manufacture of a bolt-on package to suit conventional micro-fiche readers.

The American publication "Communication Outlook" is a quarterly edited and published jointly by the Artificial Language Laboratory (Michigan State University) and Trace Centre for the Severely Communicatively Handicapped (University of Wisconsin). It regularly reports exciting developments in the application of new technology to the needs of people suffering all kinds of communication handicaps due to neurological or neuromuscular conditions.

Over only the past very few years there has been an explosive development of work in the field of aids for the handicapped. Most of the organisations concerned with one particular kind of disability for example the Spastics Society have their own collection of information relevant to their need of aids and less specialised so do the more general ones such as the Disabled Living Foundation and the Royal Association for Disability and Rehabilitation.

But a wider range of contacts is proving essential. It is sad that workers in an area concerned with communication and mobility have been so far so very little served in respect of their *own* communications. This must be remedied. Whence will come the funding for such a centre I have no idea but that a centre is essential I have no doubt at all. That ultimately a massive information retrieval centre will be developed, with international co-operation at [illegible] I have no doubt but we need [illegible] not ultimately and it will have [illegible] small.

Computer time and programming effort has been offered through the Group for Technologies and Disability's project ACE (Aid [illegible] Communications Electronics) and as a disabled information scientist myself I could help with the organisational work. What is now needed more than anything else is the information itself. Who is developing hardware and software for the disabled? For what disability? What kinds of information will such workers make available for the proposed database? With what degree of confidentiality?

I beg anyone who can produce any information on these lines to get in touch with me in the first place. I hope that we may have at least a UK Disabled Information Centre operational before the middle of 1981, the International Year of the Disabled Person.

I would like to thank *Computer Age* for giving us this opportunity for giving this venture publicity. The last time the press was used in the hope of getting a feedback of information on this matter I gather that only one response was achieved! May we here stress than *any* information is better than none and ask readers not involved in such work themselves to do all they can to spread awareness within the computer world of our desperate need for contact.

*Please write to Helen M Townley B Sc M I Inf Sc, I R Advisory Services 117 Wickham Chase West Wickham Kent BR4 0BQ ■

Editor's note *All interested readers – private professional or from companies – should respond. The disabled need help but there is a bonus for society – many of them are brilliant people whose talents could benefit all of us many times over.*

In our next issue Mrs Steve Shirley Vice President (Professional) of the British Computer Society [illegible]

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11 20	The use of conventional languages COBOL BASIC FORTRAN etc on microcomputers	**R Hiles** *Software Architects*
12 15	Lunch	
1 45	Microcomputer languages 1	**C Stevens** *Comsol*
2 35	Tea	
2 55	Microcomputer languages 2 These sessions will **examine the use of the languages FORTH and APL** under CP/M	**A Pearman** *AP Ltd*
3 45	APL a case study of the use of the language in a **commercial environment**	**R Grey** *Dick Gray Associates*
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14) Utilities for
a Percentage uplift of cost, landed and list prices
b Reset turnover count associated with each product.
c Modify existing invoice quotation and purchase order numbers
d Modify client type discount values
15) Stock record maintenance (add modify delete or leave) on all stock record fields
16) Account record maintenance (add modify delete or leave) on all fixed record fields
17) Transaction posting to client account. Facilities cash-in/cash-out and other necessary transaction adjustments Note ORDER and INVOICE produce their own specific transaction records Transaction categories (e g invoice cash receipt etc) are identified by transaction type
18) Stock analysis report, flags products in excess and to be ordered

Future Enhancements
The following enhancements are planned for the near future
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OF CONSTRUCTS AND KIPPERS

On becoming a [illegible]

In America they shout steers electronically There is a project involving the implantation of transponders into herds of cattle Their individual body functions are monitored as is their position The cowboys ride out with guns which when pointed at a particular beast and fired' display the animal s data and number (or name?) on a screen Possibly the terminals even have pearl handles

The person who told me this also mentioned, without batting an eyelid that of course people too could have such devices planted in them like criminals for instance who need not however then be in gaol since their movements could be monitored and the state of their bodies if not (but then why not at least in terms of brain waves etc?) their minds

I suppose there are about five ways you can use to find out what is in peoples minds when they do things like design compute make art You can take off the top of their heads and have a look or you can use neurophysiology a rather more sophisticated version of the first option

Less directly you can observe record and analyse behaviour or use psycho-physical techniques such as the observation of eye movements Or you might ask the subject questions Trouble is we often don t know the answers or else we lie For instance if someone asks 'Why did you do the painting in that way?

Twenty five years ago a man called George Kelly published his famous book 'The Psychology of Personal Constructs (Norton New York) He attempted to explain how similar events could lead to different behaviour in different people He used a 'repertory grid technique to elicit the dimensions in terms of which people build up their internal representation of the world! He got inside peoples heads in a new way! I and many others have been using his ideas or variants of them for some years in art design psychology

Now Dr Mildred Shaw of Middlesex Polytechnic, has published a book called On Becoming a Personal Scientist (Academic Press London Price £21 00) It makes many of the techniques and ideas available to people with computers – or even paper and pencil in some cases

The 'Personal Scientist refers to the notion that each of us according to Kelly s ideas, forms and tests theories about the world revises them, and performs as it were living experiments About half the book consists of runs of various programs which apply different techniques to the task of finding out just what theories people are using – how these alter across groups and so on

Very simply let me run through a brief outline of an experiment one might perform to elicit a set of dimensions or constructs from a person in an art context

Suppose you want to find out the ways someone has of making judgements about say abstract paintings You just take a set of different paintings or reproductions or descriptions of them and these – perhaps ten or so – are called the stimulus elements Then the person is presented with three – any old three – at a time and asked the question Can you name two of these three paintings which are in some way similar and thus dissimilar from the third? The person is then asked to say in one or two words how they differ Suppose the answer is that they are more balanced You then ask the person for the opposite pole to more balanced – ie a name for the other end of the construct that is about to emerge perhaps 'less balanced' Then all the stimulus elements – all the paintings – are rated along this scale perhaps from 1 to 5 (I should say at this point that the methodology is just an example of the way I ve done this before now – the techniques in the book are generally superior)

You repeat this process again and again and eventually you might end up with a grid that looks something like Figure 1

It can now be seen that each painting is defined by its scores along all the scales Here for example, painting number 3 scores 4 3 2 4 along each of the constructs So it is seen as rather unbalanced neither pretty nor ugly fairly focussed and more whole than 'bitty' To cut a long story short there is a great deal that can be learnt from an analysis of this grid Each element for example can be considered as located in an N-dimensional space where each dimension of that space is a construct (or dimension in the other sense) Thus one can see or compute how far' elements are from one another or how they cluster together

Another interesting point that has emerged when I've used this sort of technique in art and design it can often be shown that people have *far fewer* ways than they'd have you – or themselves – believe for making sense of (eg) the world of photographs graphic design sculpture cars or whatever They might use lots of different labels (names of different poles of their constructs) which then boil down to just a few after computation or even just visual inspection A powerful tool

Dr Shaw s book – based I suspect on her Ph D thesis – simply deals with a large number of ways of finding out about oneself and others using such techniques

Her examples cover psychiatry, art medicine, education psychology computer programs people things what more can you ask? You can obtain programs from her too, that will elicit and operate upon the secret ways we have for construing our world It can be a most amazing experience to elicit them from and for oneself I recommend you to buy or borrow this book read it, and let the

CONSTRUCTS	ELEMENT (PAINTING) NO		1	2	3	4	5	etc
	1 BALANCED	UNBALANCED	1	2	4	1	5	
	2 PRETTY	UGLY	3	3	3	2	3	
	3 FOCUSSED	DIFFUSE	1	1	2	1	3	
	4 BITTY	–WHOLE	5	3	4	4	1	
	5 etc							

Figure 1

ideas come into your own discipline or area of interest I am not the only one who has incorporated ideas of personal construct theory into art works and design tools using, for example graphic presentation of results straight back into the user s brain.

What about the kipper though?

Well I went to a symposium at Leicester Polytechnic on Raster Graphics (that is, using TV like screens to produce images and dealing with pixels – individual points on the screen and their representations in memory – rather than the old lines and vectors of earlier display devices)

As the latest real and would-be techniques splurged forth as more and more wonderful state of the art tools for visualising information were put forward I felt increasingly uneasy It was not just that you couldn t see the slides because there was no blackout; nor that the projectors both slide and film didn t work properly I have come to expect that those who spend all their time working on ways of presenting images can rarely do a slide show right!

No it was more the (sort of) converse that although the images get better and better although we upgrade our skills in showing how our simulations and models change and respond we pay less and less attention to that which is modelled

The symposium should all have been as good as its food Danny Cohen (University of Southern California) talked about VLSI

Discourse

(very large scale integration) approaches to image processing on the American NTCS (never the same colour twice) system

And for this bit of the audience it was a fine integration of hard and software ideas People from Queen Mary College (London) Marconi the Computer Aided Design Centre and Leicester Poly itself did their thing

Perhaps the most interesting thing was the list of participants guess what the following are doing with nice colour graphics and image processing Government communications HQ Singer UK Ltd and Lloyds Register of Shipping

Next most captivating was the presentation by Mr Rowley from Marconi They make simulators for – amongst other things – ships aircraft and weapons systems The speaker dealt with problems of getting visual pictorial information into a computer database Part of this seemed to involve people getting wet, taking photos of oil tankers bearing down on their rowing-boat

They turn up the noise rejection on their radar if it won t dent them they don t want to see it!

But the military stuff was what grabbed you Lots of (very pretty) work goes into little bits and pieces of almost hyper realism reflections in water textures bricks in walls But surely it is [illegible] pictures seem to be supposed [illegible] naked perception There s [illegible] dimension too Despite all the [illegible] the strike and attack simulation Suddenly it all gets rather stylized

'People don t like to see blood said Mr Rowley We just show a flash of light then it all goes darker quite satisfying, really (This of course when you ve just blown a flying weapons system to pieces) No bodies no houses blown to bits These are the most expensive pub games in the world where the space invaders are in fact other people

With reference to simulating the view from a ship s bridge it was jokingly suggested that to make it realistic you could put a kipper in the air conditioning

I d quite like to make a simulator of *all* the things in war blood on the screen realistic children being mangled convincing looking politicians scientists and generals not surviving nuclear explosions in underground shelters

There d be more than a kipper in the air conditioning too

Finally thanks to all who responded to the 'conversation piece I was wildly optimistic about numbers but my heart glows and my cynicism is marginally reduced by those several people who declared that 'Three pounds isn t enough for your program here's four Thank you ■

The author is Research Fellow [illegible] Royal College of Art

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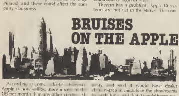
Letter From America

Peter Krass

[illegible]

Apple Computer Inc., the Cupertino, California vendor of Apple micro computer equipment, is growing fast, perhaps too fast to keep its shine. Americans are buying bushels of Apples these days and are excited over the forthcoming Apple III microcomputer system. Yet some disturbing tarnishes have appeared, and these could affect the company's business.

BRUISES ON THE APPLE



According to some [illegible] Apple is now selling more micros [illegible] US per month than any other vendor. Although the exact number has not been revealed by the company, current estimates are that 12,000 Apple microcomputers are bought each month in the US. It seems that Tandy's Radio Shack, formerly considered the micro sales leader with its line of TRS-80 machines, is now in second place.

Some of the excitement is due to Apple's May announcement of the Apple III micro system, which brought the company a lot of attention. This was especially evident at this year's National Computer Conference, America's biggest computer convention. The show was held last May in Anaheim, California (about 30 miles south of Los Anegles), just two weeks after the Apple III announcement. Prior to the show, dealers and journalists had gotten a sneak preview of the system. At the show the crowds clamouring around the Apple booth said it all. And for those that didn't see it, the crowd was well described by a computer consultant [illegible] The announcement of the Apple III is causing more excitement here than the rumours about the IBM H [illegible]

Several months later, Apple fans across the country are flooding their local micro computer retail shops with requests for the new system. Some stores have even taken orders sight unseen.

Therein lies a problem. Apple III systems are not yet in the stores. The company had said it would have dealer demonstration models in the showrooms by early June and that it would begin customer deliveries by July. As of early August the machines are nowhere to be seen.

Now the company has assured the dealers that they will have Apple III demos by the end of August. But in June they had promised deliveries by July. So the dealers, quite expectedly, are sceptical.

One New York City dealer, who asked to remain anonymous, says he will be thankful if he can actually deliver the new Apples to his customers by Christmas. "I hope I'm wrong about this," he says, "but I'm pretty sure I'm right on target. In the meantime, I'm selling an awful lot of Apple II systems. And I've already gotten 10 orders for the Apple III."

Although you can't see an Apple III in a dealer's showroom yet, the machine looks pretty good on paper. It features up to 128 Kbytes of memory, a built-in 5¼ inch floppy disk drive, colour and black and white video display screen, built-in ports for adding a printer or a modem, sound synthesizing capability, graphics features, a new operating system known as the Sophisticated Operating System and the ability to use most Apple II software. List price is between $4,340 and $7,800, depending on configuration.

Of course, at a price like that, the Apple III is strictly a business computer system. And to increase its usefulness to business users, the new system can also function as a word processor. It can also access the Dow Jones news and stock quote data base. Dow Jones also publishes the *Wall Street Journal*, America's most prestigious financial newspaper.

In the meantime, however, some of Apple's authorized dealers are singing the servicing blues. They find themselves obliged to repair older Apple machines which they themselves did not sell.

Under current agreements, Apple's dealers are required to service all Apple computers free of charge to the customer for the first three months of ownership and to supply free replacement parts for the first year. Logically, many owners of Apple micros bring their ailing machines to be repaired by their local neighbourhood retailer, who probably sold them the machine in the first place.

So far, so good. But a recent development in the marketing of Apples has changed all that. There are now several retailers selling Apples via mail order, and at very low prices. For example, the 16K Apple II has a list retail price of $1,195, and this is about what you'd pay for it in most shops. But through the mail it is available for as little as $975.

Some of these mail order retailers are little more than post office boxes connected to a warehouse. And in some cases they do not offer repair service. At any rate, it is usually easier to bring a machine to a local dealer for repairs than it is to ship it off to, say, Mobile, Alabama (the site of one such mail order house) for repairs.

Some local dealers are not especially thrilled with the prospect of servicing a machine they did not sell. They also complain of Apple's renumeration to them for these repairs – about $25. This, they say, does not reflect the cost of doing business in a big city. Unless Apple ups the repair ante, there will probably be some dealers who refuse to service machines bought through the mail. In fact, at the risk of spoiling their relations with Apple, some already have.

Sometimes the worst thing that can happen to a small company is to get big very quickly. This seems to be the case for Apple. But if they can straighten out these few problems, and avoid too many in the future, things may not be so bad in the long run. Then again, there are frequent rumours that some big company or another wants to acquire Apple. Would this benefit Apple, its dealers or its customers? Any answer at this time would be pure speculation. ■

Golden Delicious?

"Four years ago Steve Jobs and Stephen Wozniak went to work designing and assembling small computers in their laboratory – a *garage* in Cupertino, Calif. Neither had a college degree, but both had done design work for electronics companies. Gambling on future growth in the market for personal computers, their company, Apple Computer Inc., became one of the industry's pioneers. Soon Apple's compact home computers were being used for everything from teaching and bookkeeping to counting up calories and mapping diets. Demand soared, and today Apple ranks second behind Radio Shack in a burgeoning business. But the boom has increased the company's cash needs for expansion, and last week Jobs and Wozniak announced how they intend to raise the money: later this year, they said, Apple will go public."

•From Newsweek magazine, September 1st 1980

•Th[illegible] Technology News of Am[illegible]

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SO, WHAT ARE THEY DOING ABOUT SOFTWARE?

[illegible]

Good question that, isn't it? Just what are THEY doing about software? After all it is something of a problem for the microcomputer business. If you have done nothing, dear reader, other than read this column over the last handful of months, then [illegible] you will have become aware that software is not only a problem, at times it is a pain in the [illegible]

But I hear [illegible] call, who the hell are THEY?

Well one defines THEY in this context as the semiconductor manufacturers. After all it was they that started all the trouble by coming up with the integrated circuit and LSI and VLSI and one micron geometries and and ... yes I'll say it, the MICROPROCESSOR. With all that to answer for, the semiconductor industry has a moral responsibility to help control and contain the monster it has unleashed on a poor and generally unsuspecting public.

It may seem fanciful to talk in terms of the microprocessor *et al* being unleashed on the general public, especially to the many computer buffs who populate the country, except that that is the whole point of the exercise. The semiconductor industry makes its money by selling processing capability at the lowest possible cost. To do that means selling components by the pantechnicon load. When those sort of quantities are involved with computer type products the industry soon runs out of computer buffs to sell to. It has to sell to John Doe, your average man in the street. Now, he can make sense of all this computing capability if, and only if, it is in a product that he can define a need for, and can make some sense of as a complete package. Your average Mr Doe is not even going to know how to spell software, let alone understand what it is or how to use it.

So, what are they going to do about it? Well, it would seem that at last the semiconductor industry has taken up the mantle of their moral responsibility, if only because they can see a way of making money out of it. More and more they are becoming interested in methods of providing the essential systems software for their microprocessor and microcomputer products, in a bid to make the writing of applications software easier. It goes without saying that this bid also carries with it the opportunity to sell more silicon based components, and reach the potential nirvana of 'locking in' a customer to their products alone.

The long-term results of this activity should really be quite interesting, especially when looked at from the point of view of a cost/performance analysis.

For example, Jerry Sanders, president of AMD (Advanced Micro Devices) and one of the most charismatic and incisive thinkers in the semiconductor business, outlined recently the way the industry had completely restructured people's thinking on the computer.

Semiconductor memory, for example, now meant that, at a first level of approximation, *memory* is free.

The microprocessor and other complex logic devices now meant that, at the second level of approximation, *logic* is free as well.

The next target is a third level of approximation, which makes *software* free as well. He did add that this new 'free' software would only be at the systems level – he thinks applications software is going to be a high growth cottage industry for some time to come.

(As an aside, Sanders has said that he would like to see AMD's component distributors become the marketing outlets for the products of this cottage industry, a route that makes a lot of sense. With some US-based component distributors already dabbling in the marketing of computer systems of the PET/Apple/Tandy variety, it is a potential combination that throws up some interesting future scenarios.)

The way the semiconductor industry is setting about reaching this third level is to fully develop the systems software needed for their microprocessor and microcomputer products, and then make them freely available to all and sundry. Two main alternative routes have been selected so far, characterised by the activities of Texas Instruments and Intel.

TI's approach is the 'Soft' software route. They have recently launched 'Software Components' (or 'Component Software', depending on which TIer you talk to). There are two products so far available in this range, with others to follow as and when.

Available only on floppy disc so far, these products are a Real Time Executive and a File Manager. The RTE is the key product in the range, for it is intended to provide the software equivalent to a hardware system bus. The RTE defines all the software standards needed to make applications software generation easier, and allows the other systems software modules to be attached with the minimum of fuss. The File Manager is the first of these modules. It has been configured by TI to be essentially device independent and requires only a minimum of modification to run with either a floppy disc controller or a bubble memory controller. Even at this level, each system module has been written as a series of interlinking units which can be selected by the user to match the complexity of the application. A minimum configuration would provide straight forward logical addressing of memory space. It can be extended, however, to cover full file creation and management tasks if required.

TI has the next module, a data communications control system, already on the stocks, and sees a short-term potential for about fifty other system software products. Any users that feel like writing their own modules can do so, so long as they meet the RTE standards, and TI is even thinking of marketing the best ones.

As stated, these products are only available on floppy disc at present, but the company is aware of the potential of putting them in silicon, and the successful ones will almost certainly end up in this form, not least because this is the route that Intel is now embarking upon.

With the new processor families the company is to introduce – a range that

MARKET INTELLIGENCE

How many microcomputers in schools?

Returns from 60 out of 104 LEAs in England and Wales showed that, as at 15 June 1980, 663 secondary schools in the maintained sector (out of a total of about 4 598) either already had microcomputers or had them on order.

The total of machines reported suggests that most of these schools have only one machine.

Reported applications show a very high proportion being used for familiarisation and computer studies to CSE/O Level, with significant numbers of schools using them for computer aided learning and for school administration.

Computer studies, mathematics, physics and statistics came the highest in the list of subject areas in which the microcomputers are being used.

The survey on which these figures are based was carried out in the early part of this year by CET and the Schools Council collaboratively.

The purpose of the survey was to provide, at low cost, a snapshot of the current level of provision and use of microcomputers in schools in England and Wales. It was recognised from the outset that there was no possibility of the survey being comprehensive, particularly since the situation is changing rapidly, even from day to day. In order that the results might have a longer term usefulness, they have been used as the basis for a computer database to which additional information can be added on a continuing basis.

Copies of a short report summarising the main findings of the survey can be obtained from **Jill Coates**, CET Information Officer, at 3 Devonshire Street, London W1N 2BA.

(CET stands for the Council for Education [illegible]) includes a 32 bit device said to have power equivalent to an IBM 370 mainframe. It is also introducing operating system firmware modules that will contain the kernel of the required operating systems. For the lower power processors this will be the recently introduced RMX86 but for the more powerful systems two new operating systems will be made available.

The products themselves from Intel are interesting for in addition to the chips the company is introducing an entirely new part numbering system. There had been talk for some time of new products called the micromini, micromidi and micromaxi from the company and it has now defined what these both are and are to be. The numbering system is based on a new processor designator — IAPX. Don't ask what it stands for. Intel people aren't too sure themselves. (Some wags have suggested Intel Advanced Processor Xperiment!) To this is added a two number set, the first defining the processor family, the second defining the specific components that go to make up a selected processor system. It marks quite a departure from the company's normal numbering system and is in fact quite straight-forward — in an inordinately complicated way.

This is how it works.

There will be five processor families in the range (not including the existing 8048 family and the 8080 and 8085). The 8086 and 8088 will now be known as the IAPX86 and IAPX88 families. However, if you wish to purchase just an 8086, for example you will need to ask for an IAPX86/10. Now, both the 86 and 88 can be used with the 8089 I/O processor and 8087 numeric processor and in the new numbering system the combinations can be specified by a single number. So an 8086 and 8089 together is called an IAPX86/11 and 8086 and 8087 becomes the IAPX86/20, and all three together becomes the IAPX86/21. Straightforward, isn't it?

'This is how it works'

This type of designation is followed through with the IAPX186 processor, a new 16 bit device that will incorporate a considerable amount of I/O handling capability. The IAPX86 and 186 form the micromini group. Next comes the IAPX 286, a 16/32 bit unit which is the micromidi, and the IAPX432, the micromaxi, which is the full 32-bit device. For these latter two processors there will also be new operating systems available in firmware modules, and by having four individual circuits from which to choose in these families the company will be offering eight different combinations under its numbering system and is following the pattern already outlined. As I said, it's straight forward in a complicated sort of way.

The point of all this is that by using silicon based hardware of this type in the design of a system it should be much easier to develop the box. Then maximum effort can be placed on the development of the applications software needed rather than on the systems software. Intel has already gone some way along its chosen route prior to the introduction of operating system firmware. By making I/O (input output) and numeric hardware it has picked off two of the most common system software tasks found in computers. Using them these tasks can be implemented simply by specifying a component (i.e. try not to order the new [illegible] system) rather than by committing programmer resources to the writing of them.

It goes without saying, of course, that this route sets the user up as a potential Intel customer in perpetuity.

This acceptance of the responsibility for helping users overcome the software problems has really only just started. The semiconductor industry took a tiger by the tail when it developed the microprocessor but it has decided not to let go, but to try and tame the beast instead. The end result can only be guessed at if the industry finally manages to make the tiger a domesticated moggy. ■

•Martin Banks is editor of Microcomputer Analysis, a [illegible] publication

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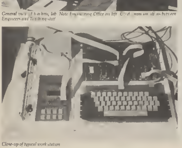
SETTING UP A MICRO CENTRE

The National Economic Development Council published a survey of some 70 micro computer users and vendors revealing an acute shortage of skilled manpower within the micro industry. This shortage of trained staff has always been a part of computing in general – look at the trade journals: they survive on their job advertisements for mainframe analysts and programmers. The situation with micros however is desperate. The scarcity of skills in this field is the major restraint to growth. Such skills as micro electronic engineering, the ability to design reliable software and especially complete systems, are rare enough to command high salaries indeed but the demands for labour still outstrip by far the available supply.

John Sanders

General view of teaching lab. Note Engineering Office on left. Good communications between Engineers and Teaching staff



Close-up of typical work station

Everyone knows the situation, and the remedies quite simply: more and better training, better directed and applied. But who is to provide this training? Should it be the vendors, short of staff themselves? Micro users certainly couldn't. Perhaps the most appropriate centres of training ought to be the traditional seats of learning, the Universities and Polytechnics. However, the Universities in particular have been criticized for graduating computer scientists who may be able to write an operating system but not a validation program, and electronic engineers who have never even seen a microcomputer let alone are able to build one. The needs of industry seem to have been forgotten. For example, a freshly graduated computer scientist is generally reckoned by the average Data Processing Manager to be worth the equivalent of an unqualified trainee with between six months and a year's experience. Further, graduates' training tends to be either/or, with little (if any) knowledge of *both* hardware and software. There are very few people with a broad, integrated knowledge of microcomputer systems. This is not good.

And there are as few courses where such a combination of training is available, where this integration exists. So what is being done? Some colleges, such as Manchester, Cardiff and Loughborough, have worked towards such an end. Their training has been designed to provide, amongst other things, this broad system based knowledge, as it has at City University in the City of London.

There, discussions were held between the Departments of Computer Science and Electrical Engineering, and the Computer Unit which is responsible for the overall computing service at City, and an agreement was reached to pool resources to provide a general University service for microcomputing. The Microprocessor Laboratories (as they are known) were opened in May last year by Sir Peter Parker. There are two laboratories, one for teaching, one for research. The title incidentally is a slight misnomer. Microprocessor work is just one of the facets of microcomputing that is taught and researched at City. Others include microcomputer programming, both at high and low level, hardware design, and application oriented research projects.

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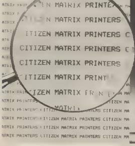
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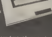

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The micro lab falls upon the Director of the Computer Unit, John Page. He considers microcomputing facilities essential to any science oriented institution like City, and sees the effective coordination of those facilities as one of his major tasks. He said: "I can see a merging of computer engineering and computer science in the microprocessor labs forming a middle ground." The problems? The usual (but somewhat ironic) ones of finding competent staff and sufficient funds, and the perennial lack of adequate support software. However these problems are being solved, and the labs are now in constant use.

Particularly worth a mention is the problem of engineering support. There are engineers at City (unlike most other University set ups) with vast experience of computer engineering in the Computer Unit i.e. University wide. These support staff — vital to actually running a decent service — have also been crucial in the getting together of the different departments to form this common pool of resources. It seems certain that without the support engineers, who have been involved in microprocessor developments since the early '70s, everyone would have

City University

[illegible] the [illegible] problems [illegible]

While the [illegible] support [illegible] the academic [illegible] Dick Crawley [illegible] the work [illegible] of the courses that City [illegible], which are for both internal and external users, those for outside participants running under the DOI Microprocessor Applications Project.

The courses provided for external users are both introductory and advanced, covering most aspects of microcomputer technology. They vary from two days to a week and most include a substantial amount of hands on experience. There are also evening courses available for people without any previous knowledge of micros and who can't get away during the day. These courses have proved tremendously popular with a very swift uptake following little advertising (mainly in the electronic engineering press). City also do tailormade courses on request, some of which involve in house training for the company concerned.

The internal side of teaching falls into two categories. Firstly there are integrated sections of degree courses where electronic engineers learn about software design, and computer scientists are taught about architecture, bus structures, interfaces and so on. Secondly there are 'specials' — three day courses for naive undergraduates not directly concerned with computing but interested in micros, where they can come and learn about micro technology, again with a substantial amount of hands on. The aim of these introduction to microcomputing courses is to enable students to under[illegible] system up and running [illegible].

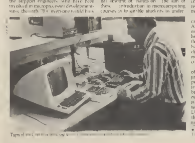
The system in question would be [illegible] the Nascom 1s, Motorola [illegible], Texas TMS9900s or perhaps a Cromemco Z2. There are a lot of other bits and pieces around such as various peripherals, discs, etc, and test equipment such as logic analyzers, but most work is done using one of the above. There are other machines around, for example the Systems Science Department has a PET for students use. At the labs though Micro

[illegible] Ferranti [illegible] Research [illegible] of Defence

soft BASIC, CP/M and the S100 bus tend to be the standards. The micro lab asserts standardization is extremely useful in getting as much hands on practical experience as possible because students don't have to wait for their machine but can use any of the standard models. When non-standard work is done, a logic analyser mentioned earlier is then used. This device is very useful for debugging dedicated systems, several of which are being researched using Ferranti F100s.

The research includes amongst other things a Roving Slave Processor, a device based on bubble memory and an F100L which can be loaded from a master computer with whatever programs are required for the job in hand (say an ECG monitoring system for a heart surgery victim) and is then totally mobile and free to carry out its job wherever necessary. Another project is self designing instrumentation for signal processing. The aim here is to produce instruments so that once the requirements (bandwidth for example) have been keyed in, the instrument will design itself! This field of adaptive instruments is one of several project areas currently under research at City.

It can be seen then that although some of the fire that Universities come under is justified, City University is making a positive effort to take full account of micro technology. Not only is an integrated broad based approach to the new technology being practiced, but also research is proceeding along truly application orientated lines. This is surely the way that the Universities must go if they are to turn out the kind of graduate needed now and in the future. ■



Typical [illegible]

- The author is a student at the City University, London.

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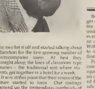
TEACHERS AND BOOKS; OR MICROCOMPUTERS AND VIEWDATA?

Although few people believe that face-to-face teaching will ever be completely superseded this article outlines some breakthroughs in computer assisted self teaching being made by one progressive British firm

The future of education white collar staff training and home study lies in a book free world of microcomputers and viewdata That is the vision of Jonathan Baldachin a director of the delightfully-named Little Genius, a small UK company specialising in computerised teach yourself programming packages based entirely on floppy discs and with no reference manuals And before all you teachers take to the streets in protest Baldachin s partner Peter Brown is quick to apply the brakes of sanity if Baldachin gets too carried away

One thing Brown and Baldachin agree on is that their way of going about teaching is right And their credentials are good After several years on computer design Brown went to Zambia where he was put in charge of training all computer staff for the Zambian government When he returned to the UK in 1975 he became a freelance training and computing consultant and is able to number government departments and some big oil companies among his clients

Baldachin started as a programmer and became a freelance analyst and consultant He met Brown when he was commissioned to put together one of Brown s courses



The two hit it off and started talking about education for the fast growing number of microcomputer users At first they thought along the lines of classroom type courses – the traditional sort where students get together in a hotel for a week.

It was at this point that their vision of the future started to form Our costings showed up the tremendous overheads of hotel rooms books and lecturers says Baldachin 'There s also the problem of setting the pace to the slower people And people can't always leave their businesses in the day, the courses especially people running very small businesses. This all led us to the need for training the user can do himself. [illegible] because the [illegible] supplies only [illegible] guides to [illegible] the things [illegible] in ten [illegible] These [illegible] to beginners as teaching needs

> *'Not everyone has the time or self-discipline to sit down with a book and learn '*

Brown agrees 'One in five inquiries we get come from people who say I bought my micro six months ago and still can t understand how to program it Not everyone has the time or self discipline to sit down with a book and learn BASIC With our type of course you re not afraid to sit down at the keyb and because the first thing we show you is how to use it

Formed last year Little Genius offers courses for users of the Apple II and its equivalent the ITT 2020 There are courses on using the Apple II BASIC and advanced BASIC on the Apple and BASIC and advanced BASIC on the 2020 Courses for Commodore PET users will be out soon

The courses which cost £40 each from computer shops or by post from Little

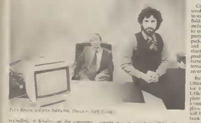
Genius mostly take 10 to 12 hours to get through. As the courses are modular, users can jump from one lesson to another as they wish, although the lessons are arranged in a logical way. The BASIC course, for example, starts with how to use the keyboard and progresses through writing a simple program to loops, variables, subroutines, strings, manipulations and complex IF constructions.

How did Brown and Baldachin develop their vision of the future from selling £40 BASIC courses?

"Since we've been involved in computer assisted learning, we've seen three markets appear," says Baldachin. "There's the education market, from primary schools to universities. Then there's industry training, or anything to do with the office. But the biggest market of all will be home study using viewdata services.

"The greatest need initially is for computer assisted learning systems to teach teachers about computing. Local authorities are buying batches of micros and the maths teacher or whoever's put in charge of the machine is only keeping one jump ahead of the pupils. You have the problem that the kids get so keen that they soon know more than the teacher.

"Once the teachers and children know about computing the next step will be the


Peter Brown and John Baldachin: Directors, Little Genius

recording of lessons on the computer. Every school or group of schools has a few teachers who are fantastic at their special subjects and at putting their ideas across. They will write computerised lessons which will go to a central library for dissemination to other schools. These lessons will be small modules such as tutorials or a lesson on a single physics experiment."

It is at this point that Baldachin and Brown start to disagree. "These systems won't replace the teacher but will help him," says Brown. "In addition the day's not far off when lots of homes will have microcomputers. Parents will buy the lessons for their children and of course there will always be a large home-study market."

Self-Teaching

Baldachin goes further. "I see pupils working on their own. If someone wants to learn German in a school where French is the only language taught he will be able to do so. The teacher will have the teaching skills but won't need a deep knowledge of German because that will be provided by the system. You could even have all the children in one class doing different things at once with just one teacher in charge. In 10 years secondary schools will be unrecognisable to people today."

Brown does not share this vision. "You won't get away with teaching without a specialist in the subject," he insists, although he sees a future for this type of learning in commercial colleges.

What Brown and Baldachin do agree on is the inevitability of the spread of micros in schools. "Whatever other effects the government funding cuts have on education, the sheer pressure from society on schools to teach about computing will force the money out," says Brown. "About 1 000 of the 10 000 secondary schools in the UK have micros. In the next couple of years very few will be without one; they'll be standard equipment, like projectors."

Forecasts from ITT support these predictions. Last year the company forecast that there would be a massive 22 per cent growth to 80 000 personal computer sales in the UK in 1980 and a slower growth to 250 000 sales in 1983.

If the education market grows as quickly as these figures imply and as Brown and Baldachin expect, Little Genius will be well placed to help. The controlling software of the Little Genius courses is being adapted to produce an interactive system which will allow teachers to put together disc based lessons.

"We're not interested in writing the lessons – that's best left to teachers," says Brown. "We'll act as evaluators of lessons and as the central library." Charges will be in line with school budgets; the partners are thinking in terms of £300 a year for running the library and an £8 handling charge on lessons.

But what about the Council for Educational Technology, home of the UK government's four-year £9 million micro education scheme? "They've no director, no staff allocated and no brief yet," says Baldachin. "By September we'll have our product ready to offer teachers."

If some of Baldachin's views on education verge on science fiction, he and Brown are down to earth on the future of computer assisted training of office staff.

"At the end of 1979 there were 700 microcomputers in local government departments, traditionally users of central mainframes," says Baldachin. "This is the trend throughout industry. You get a manager saying things like 'We spend all day waiting for the computer department to produce a list of plumbing jobs while we've got plumbers sitting around waiting to go out.' The trouble is training people to use the micro when you get it. It's bought out of petty cash and given to someone with a manual and the instruction to learn how to program it." Baldachin's view on the value of manuals as teaching aids clearly apply.

Computer-assisted learning will also be used by people who need to find out how to use big computer systems, according to Baldachin and Brown. These people will include end users who need to know how to use inquiry systems and interpret reports from standard packages. These packages are expected to become more and more widespread because of the shortage of the computer staff needed to produce one-off systems. And the high turnover of computer staff makes any alternative to expensive residential courses an urgent concern.

But viewdata services like the UK Post Office's Prestel will be the biggest market for training packages, according to the Little Genius partners. "There'll be complete home maintenance courses, with lessons on plastering and fitting a pane of glass on Prestel," predicts Baldachin. "It will be cheaper to go to Prestel than to a book. After all, why buy a book of curry recipes for £10 when you only make curry once in a while and can get the instructions from Prestel for 20p?" Brown agrees and points to home study again, this time as a viewdata service.

However much of Baldachin's and Brown's vision of the future is realised – and some of it is already materialising – it is clear that Little Genius will be well placed to take advantage of the opportunities. ■

• *John Kavanagh is a freelance journalist with almost nine years experience of the computer [illegible]. He was a programmer for three years before turning journalist. He has been data [illegible] magazine Data Processing and has spent [illegible] at Computer Weekly, latterly as editor.*

ROBOTS IN INDUSTRY

The author gives an [illegible] important industrial use of [illegible]

Functional robots are becoming increasingly evident in a number of fields. They are significant in hospitals, schools, power stations, bomb disposal activities and the domestic environment. Industrial robots in factories are finding an increasing range of applications, and there is a growing acknowledgement that factory robots are important to the survival of industrial economies in a competitive world.

It is interesting to see how the profile of robots is growing in the UK media. Until recently they were given little exposure, though technical material has appeared consistently in some journals for a decade. Now the popular press has realized the significance of industrial robots and we even see the beasts doing clever things on television (in addition to the Fiat advertisement – hand built by robots.)

The attraction of robots for production purposes is easy to see. Though humans have great flexibility of response, they are vulnerable in dangerous conditions and can be driven to apathy and recalcitrance through boring and repetitive jobs. (There is evidence that production line workers may sabotage assembly lines simply to relieve the tedium.) Moreover, human workers can get tired, ill or ambitious. By contrast, industrial robots are tough, unconcerned at radioactivity or toxic chemicals, and if they get bored they do not show it. Furthermore they are as yet indifferent to trade union rights. Many industrialised countries have long recognised the value of industrial automation in which robots play a substantial part. In this area, as elsewhere, the UK lags well behind.

It is important to realise the wide range of tasks that robots can perform in the industrial environment. They started out doing simple production jobs, mainly welding and simple transfer tasks. Now they perform a multitude of industrial operations, eg framing complete car bodies, stamping and assembling metal and plastic components, feeding materials to machinery, loading trucks, handling glass, moulding plastics, doing foundry work and stocking warehouses. The spray painting of vehicle bodies is seen as a key area for robot implementation: several years ago it was practical for robots to paint a range of different car body styles in any of dozens of required colours. Robots can also perform complex assembly tasks that would have been unthinkable a short time ago. Increasingly, system designers are looking to the concept of the unmanned factory in which robots will play an important part. Some pundits reckon that Japan will get there by 1985.

Robots can perform simple and complex transfer tasks. They can load/unload equipment (eg as in pressure die casting, injection moulding, metalworking, cold/hot pressing, heat treatment, glass cutting, soldering and brazing) and carry out many tasks in process engineering (eg forging, fettling and investment casting). In all these applications the workpiece is gripped by the robot. In other types of implementations the workpiece, secured in some other way, is operated on by a robot-held tool. Such applications are metalworking (eg flame cutting, grinding and pneumatic chipping), joining (eg spot welding, arc welding and stud welding), surface treatment (eg paint spraying, enamel spraying, glass fibre and resin spraying, sprinkling enamel powder, ceramic ware finishing, water jet cleaning and applying sealing compounds), inspection (eg dimensional checks) and such operations as glass gathering and marking.

Applications

The largest robot manufacturer in the world is the US company Unimation. Their robots (eg the Unimate series) can perform many of the tasks indicated above. More than two dozen Unimate

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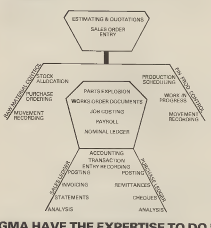

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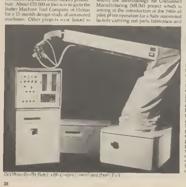
Application Notes each describe a particular robot implementation with reasons given why a Unimate robot was used in the case in question. Applications dealt with in this way include glass manufacture, ordnance manufacture, rubber bale handling, loading abrasive machines, metal forging, ceramic substrate grinding, injection moulding, chain link fabrication, conveyor palletising, gear blank processing, die-cast quench and trim, chucker loading, heat treatment, refractory brick loading and harrow disc handling. And so on and so forth.

There is immense variation from one developed country to another in the scale of implementation of industrial robots. There is enthusiastic implementation in such countries as Sweden, Italy, Japan and US, while other countries (eg the UK) seem scarcely to have heard of robots, though there are signs that UK awareness is increasing. Hall Automation, the only indigenous UK manufacturer of robots (acquired by GEC Marconi in December 1979) has followed a lonely path for several years, but now has been joined by a few other UK firms interested in supplying robot components or manufacturing (or assembling) complete robot systems. In March Fairey Holdings announced a deal whereby it would assemble industrial robots from components supplied by six Italian firms.

The UK government has supported to a very limited extent the development and implementation of industrial robots. Early in 1979, before the advent of the Tory Government, the Department of Industry announced a grant of more than £500 000 to aid research and development of robots for automated small batch factory production. About £70 000 of this was to go to the Butler Machine Tool Company of Halifax for a 12-month design study of automated machines. Other projects were linked to work being carried out at the National Engineering Laboratory.

A special initiative to aid the development of robots for industry was announced by the Science Research Council in late 1979. The aim was to set up five or six partnerships between university groups and potential users to do practical research, with about £1 million committed to the work over a two-year period. In addition, the Department of Industry has financed four pre-production orders for robots, whereby the government pays for a robot, gives it to a factory, and if the firm likes the robot it buys it. This sort of support is important and should be extended. A recent report (*Joining and Assembly: the Impact of Robots and Automation*) produced by the Advisory Council for Applied Research and Development (ACARD) emphasised that there is an urgent need for United Kingdom industry to increase productivity through the wider application of robots and general automation, particularly in those manufacturing industries which face competition from the newly industrialised industries with low labour costs.

UK government support for robots is small compared with what is happening in other countries. For example, in Japan the Ministry of International Trade and Industry (MITI) has supported automation research in its own institutes, with further support provided by private industrial research associations. Much of the Japanese robotics research has been co-ordinated within the Methodology for Unmanned Manufacturing (MUM) project, which is aiming at the introduction in the 1980s of pilot plant operation for a fully automated factory carrying out parts fabrication and assembly. The original programme has been superseded by a new project funded at £2[illegible] million over a 7 year period.



DeVilbiss Trallfa Robot with Control [illegible] and Pre[illegible]

[illegible] Robot in [illegible]

Activities in other countries are also extensive. The US Automation Research Council has proposed a programme which requires expenditure of $300 million over seven years, the funds to be provided by government and industry. The National Science Foundation is supporting research into automated assembly with projects at the Stanford Research Institute, the Charles Stark Draper Laboratories and elsewhere. In West Germany public support for the development and application of industrial robots since 1974 has been achieved via government research programmes (Humanisation of Life at Work and Manufacturing Technology) and via basic research activities sponsored by the Deutsche Forschungsgemeinschaft (DFG, the German Research Society). DFG allocated about £20 million annually to engineering research, including the development of robot systems. Various other European countries – Sweden, Italy, France, etc – have made facilities available for public funding of research and development in the field of industrial robots.

There is some uncertainty about the number of robots operating in the various industrialised economies. This is partly a matter of definition. Some robots are simple pick and place units, relatively inflexible in operation and dedicated to one straightforward task. Others are complex programmable units with sensory facilities, able to respond autonomously to changes in the environment and to decide between different courses of action. If all types of robots are considered, Japan is generally reckoned to have in excess of 50 000 (with possibly 5000 being fully programmable). By contrast, the most optimistic estimate of the UK robot population puts the total at under 200. Japan is regarded as having half the world's robots, with the US having a quarter and Europe a quarter. In Europe, taking account of the size of national economies, Sweden has been the most enthusiastic country in implementing robot systems.

There is a strong anthropomorphic ele

[illegible] nd thus reflected in the [illegible] trunk arm wrist [illegible] en talk of robot eyes and [illegible] The hands ("grippers") of a [illegible] resemble a human hand [illegible] the Eighteenth Century the [illegible] has been the model for a [illegible] theses and telemanipulators [illegible] the hand has been investi[illegible] the bones to help the [illegible] versatile robot grippers

[illegible] the development of robot limbs [illegible] and legs has been aided by [illegible] the jointed limbs occurring [illegible] the biological world Development has [illegible] in part conditioned by the [illegible] applications For example arts [illegible] are better than straight un[illegible] in coping with various opera[illegible] nts Gripper designs can [illegible] multiple fingers suction cups [illegible] elements piercing components [illegible] elements And robots may be [illegible] multi armed

[illegible] used for industrial [illegible] However there is abundant [illegible] in this area For example [illegible] adaptive walking [illegible] evolved over the past [illegible] the attainment of the necess[illegible] function by an on [illegible] not practical prior to [illegible] the microprocessor Robot [illegible] useful in many applications [illegible] locomotion facilities [illegible] For example artificial [illegible] in such areas as arctic [illegible] agriculture forestry [illegible] surveys and [illegible] exploration

The most sophisticated robots are con[illegible] by a brain capable of taking deci[illegible] For years this sort of intelligent fac[illegible] has been provided by minicomputers [illegible] housed *external* to the operating [illegible] often in a separate room More recently robot intelligence has been pro[illegible] by microprocessors small enough to be incorporated as an *integral* part of [illegible] design

There are various ways of programming [illegible] the scope for an individual [illegible] being determined by its level of sophistication and its expected flexibility in the operational environment Three broad programming techniques are available *physical set up* where programs are

Robotics

established by [illegible] setting switches [illegible] as with the 24-step [illegible] (common in [illegible] stored on magnetic tape or disk [illegible] robot is manually taught the [illegible] by an operator and [illegible] where the operator, using a [illegible] has the robot the required motions [illegible] robotics research is focusing on [illegible] these programming techniques

Robots, like computers [illegible] generations Here again there is some confusion in terminology What exactly constitutes a

[illegible] Robots [illegible]

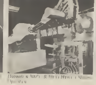
Generation 1 or Generation 2 industrial robot? Generation 1 machines certainly include the simple pick and place devices But what about sophisticated programmable systems? Some observers put them in Generation 1 or Generation 1 [illegible] others in a newly emerging second generation There is broad agreement that Generation 2 is characterised by enhanced sensory facilities robot mobility and (often microprocessor based) intelligence

There is a growing demand for robots throughout the developed world In a recent Frost and Sullivan report (*The Industrial Robot Market in Europe*) it is pre[illegible]dicted that the [illegible] increase three fold [illegible] total market value [illegible] The importance of [illegible] is not simply that traditional [illegible] rendered more efficient [illegible] industries are [illegible] A company that develops a robot for its own pro[illegible] find that it has generated a [illegible] marketable product

In the UK there are plenty of signs of a new awareness of robot potential This is partly due to the efforts of the British Robot Association (35 39 High Street Kempston Bedford) In this country there is plenty of expertise and ideas but there is inadequate investment for production purposes There is debate as to why this should be so However the implementation of cost effective technology in general and robots in particular does not happen automatically without the managerial and political will Britain ignores at its industrial peril the cost-effective and enthusiastic robot implementations in other countries throughout the developed world ■

●*Geoff Simons is the Chief Editor NCC Publications and author of* Introducing Microprocessors *(1979)* The Uses of Microprocessors *(1980) and* Robots in Industry *(1980)*

[illegible] Robot [illegible]



[illegible] R[illegible] Hand [illegible] Operation

George Kuikka Electrical [illegible] R[illegible]ot

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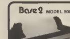

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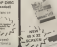

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John Brooke

TOOLS FOR THE JOB

The Human Factor

[illegible]

It is not uncommon now we have a popular computing press to find articles instructing the tyro programmer in ways of writing better, cleaner, error free programs. Naturally different experts have different views, so any expression of a point of view tends to be followed by a welter of counter articles and letters. However, it is noticeable that most of this debate takes place at a theoretical level and that empirical evidence for or against any particular approach to programming is generally lacking. The whole question of the efficiency of the programmer in performing his task is likely to be of crucial concern in the future with the rising software to hardware cost ratio, and it would perhaps be helpful to describe some of the human factors research that has been carried out on the effects of different programming languages and styles on programmer performance.

To begin with, it should be pointed out that it is by no means easy to study programming from a psychological point of view, since it is such a complex activity. There are various ways of gathering information, all of which have certain advantages and disadvantages.

Some researchers have tried to observe what programmers do in using existing languages and techniques. This provides us with important information about bottlenecks in the programming process and the way in which future programming aids might be developed.

For instance, debugging of programs has been found to constitute a major bottleneck in the development of software – estimates have been made that programmers spend three times as long debugging programs as they do actually coding them and that, in terms of cost, this can represent from 25-50% of the total in a large software project. Interestingly, however, several studies have shown that the majority of errors are conceptual errors rather than syntactic errors. One team of researchers found that an amazing 80% of all FORTRAN and assembler programs submitted to a large time-sharing system compiled correctly first time (1). (That of course doesn't mean they *worked*.) This has led to suggestions that there is little point in further developing syntax checking software and that many facilities already available are unused (2).

Observational studies, in fact, have a habit of knocking fondly-held beliefs about the things programmers find useful: interactive symbolic debugging programs are theoretically powerful tools for the location of errors, yet there is some evidence that indicates that, where they are available, they are not used (3). Observational studies, of course, require us to examine existing systems. This means that we cannot try out new ideas without those ideas being incorporated in a system, a process which might be rather expensive. It is also difficult, with the type of information gathered in a survey, to pin down precisely what software tools and programming techniques are most useful and efficient.

The most potent criticism of observational studies is that they are concerned mainly with the present performance of programmers, not with ways of *improving* their performance. We therefore need some other way of studying programming problems more precisely without excessive cost.

To this end, other researchers have adopted a comparative approach to examine the problems identified by observational studies. In essence, this means that they have tried to isolate a particular point of difference between software systems or programming techniques and to assess the effect of this difference on the performance of the programmer. This is not as easy as it sounds, unfortunately.

Suppose we wanted to provide some empirical evidence which would help to resolve the question which is currently taxing correspondents to the microcomputing press – is Pascal a better language than BASIC?

First of all, we would have to define our criteria for what we mean by 'better'. Do we mean that programmers write a program faster in one language than in another? If so, we would have to take account of the different ways in which a program is actually composed and translated into a form acceptable to the computer (eg compiler versus interpreter). Is speed of composition alone any criterion for a 'good' programming language? Surely we are interested in the number of errors that the programmer makes and how long it takes to correct them. There is not much to choose between a language where the program can be written in twenty minutes and debugged in five days, and one where writing takes five days but there are so few errors that debugging takes twenty minutes. Do we want other people to understand the program? And suppose we get programmer A to write a program in Pascal and programmer B in BASIC? How do we know that they are both equally good at their job? We must also be very careful with the type of program we ask the programmer to write. If we were to set a problem that required the use of sophisticated data structures then Pascal would fairly obviously win hands down because these structures just aren't available in BASIC.

These are just some of the points that have to be considered in comparative studies of programming. In general, researchers have found that the points of difference between programming languages are too numerous for any meaningful comparison to be made. It is still possible to study, say, different programming techniques such as the use of mnemonic variable names or the amount of commenting in a program, or degree of modularisation of a program within the confines of a single programming language, but many of the problems still remain. We still have to assure ourselves that we are using sensible criteria to evaluate performance, that we can make comparisons between the performance of different programmers who have differing experience and programming styles, and so on.

Another approach has been to study programming outside the context of any conventional programming language. In this type of research, 'microlanguages' are devised which consist solely of the particular features the experimenter is interested in. This in itself removes a lot of the possible sources of experimental error, and there are other advantages. For instance, we can keep the microlanguage simple so that non-programmers can take part in an experiment without having to undertake a long training period. This means that we are surer that we are making a real comparison between the particular language features or programming techniques, because we have controlled the amount of experience and the method of training given to those people taking part in the experiment.

However, this approach can be criticised on the grounds that, whilst it may be neat, it doesn't give results that can be generalized to real programmers working in real languages on real systems. Well, that is true, but if we start off our study of programming problems in such a way that we know what is going on, we probably stand a better chance of retaining some grasp of the situation as we increase the complexity of the problems. So if any of the work that I describe seems to have a "toytown" atmosphere about it, please bear in mind the problems I've described. I will now try to give the reader some idea of the range of topics that have been studied and the methods used.

The hungry hare

One of the linchpins of any programming language is the way in which it expresses conditional statements.

The alternatives are generally the '*if* condition *then* operations *else* operations' construction typical of ALGOL-like languages and the '*if*-condition *go to* label' construction of FORTRAN and BASIC-type languages.

Designers of future languages really need to know which of these two constructions is easier for programmers to use in order to develop 'user friendly' software. These alternatives have been extensively studied by Max Sime, Thomas Green, Mike Fitter and their associates at the Medical Research Council Social and Applied Psychology Unit in Sheffield. The techniques they have employed in their studies have been to get people (often non programmers) to write programs in microlanguages with differing conditional statements for a device they call the 'hungry hare'.

This somewhat moronic animal has to be told how to cook its food – for instance if it is green and leafy, then boil it; if it is chewy and brown, then roast it, and so on.

The physical embodiment of the hare is a primitive card sorting mechanism which, fed with cards bearing these attributes, will sort them into piles to be roasted, boiled or otherwise cooked. These researchers have gone into problems associated with conditional statements in some depth and the ALGOL-type construction has proved to be superior to the 'if-go-to' on a number of counts. Programs were easier to write, less errors were made, when errors were made they were corrected more quickly, and programs written by other people were understood more easily (4).

Experiments such as these provide pointers for future language development. What can those of us who are working with existing languages such as BASIC and FORTRAN do to reduce the number of mistakes we make?

Ben Shneiderman of the University of Maryland and his colleagues have subjected a number of programming techniques to scrutiny (5). When they asked programmers to debug FORTRAN programs written by other people, they found that programmers performed just as efficiently using uncommented programs as they did using commented ones; in fact many programmers said that they actively ignored comments because they found them misleading. Use of meaningful variable names, on the other hand, improved debugging performance, especially as programs became larger and more complex. Programs written in a modular form were understood and modified more easily, although there are few guidelines as to how to split a program into modules: one man's module is another man's meaningless mush.

A fourth topic studied by these workers was the use of flowcharts in the debugging and modification of programs. Shneiderman and his colleagues found no evidence that flowcharts helped at all in the debugging and modification of programs, and that they only provided assistance when programmers were tracing their way through the program without having to understand the underlying processes.

> 'This somewhat moronic animal has to be told how to cook its food'

These results are considerably at variance with accepted wisdom concerning the use of flowcharts, and other researchers have reported results which showed them to be a better way of presenting procedural information than listings (6). Currently we are working on a Social Science Research Council project in Cardiff investigating ways in which diagrammatic representations of systems affect people's performance in finding faults, so this seemed to be a topic which needed further examination. One of the problems associated with the work Shneiderman and his colleagues performed on the use of flowcharts was that they couldn't be sure if programmers were actually using the flowcharts. Because they were using experienced FORTRAN programmers in the experiment it's quite possible that they had developed differing programming habits, which need not include the use of flowcharts.

Our approach was to get non programmers to locate faults in a program written in a microlanguage. This language we invented was supposed to be used to program a hypothetical control mechanism (of the approximate complexity of a programmable calculator) operating a multigrade petrol pump. The instruction set was a fairly unambiguous subset of English with a few mathematical operations thrown in, so non-programmers could learn it fairly easily. A major advantage of the language was that it could be represented either in the form of a flowchart or in the form of a listing simply by boxing in statements, joining them up with arrows and replacing 'go-tos' by arrows – something you cannot do with FORTRAN. (Notice we used the 'go to' conditional construction – this was not because we had ignored the Sheffield work, but because we wanted comparability with other work on FORTRAN type languages.) This meant that we could present virtually identical information in either form and it was not necessary to provide both listing *and* flowchart: thus we could be sure that any differences were the result of using *either* a flowchart *or* a listing.

What we found was that using a flowchart doesn't improve the identification of program bugs. The only positive effect seems to be that when people have some experience of using flowcharts they tend to identify the general area of malfunction even if they don't pin down the error precisely (7). Since we did this experiment we've tried to investigate the debugging process in greater detail to see whether or not it is worth bothering to draw a flowchart of a program once it is written. In general we've found that it's quite useful to have a flowchart to hand when you are trying to decide where to insert a breakpoint in a program because flowcharts do apparently clarify the conditional structure of a program as long as it is in a simple tree form. When a program is not a neat branching structure (for instance if we use subroutines and a particular subroutine can be called by a number of other subroutines at different levels of the tree, or if you are trying to locate a faulty module by inserting data into the program and seeing what happens) you may just as well work directly from a program listing.

I hope this brief foray into the jungle of the psychology of computer programming has shown that discussions about 'best ways' to write programs do not need to be conducted solely on a theoretical level. There are certainly problems with trying to assess what tools are best suited to the job of programming, but if we can think clearly about our aims in trying to design these tools perhaps we can make the information society accessible to a larger section of the population than the technocrats to which it is at present confined. ■

References

1) S F Boies and J D Gould Syntactic errors in computer programming *Human Factors* 1974 16 253-257 **2) L A Miller and J C Thomas** Behavioural issues in the use of interactive systems *International Journal of Man Machine Studies* 1977 9 509-536 **3) J D Gould** Some psychological evidence on how people debug computer programs *International Journal of Man Machine Studies* 1975 7 151-182 **4) T R G Green, M E Sime, M Fitter and others** Memoranda Nos 66 79 110 113 118 Medical Research Council Social and Applied Psychology Unit The University of Sheffield **5) B Shneiderman and D McKay** Experimental Investigation of Computer Program Debugging 6th International Congress of the International Ergonomics Association College Park Maryland 1976 **6) P Wright and F Reid** Written information: some alternatives to prose for expressing the outcomes of complex contingencies *Journal of Applied Psychology* 1973 160-166 **7) J B Brooke and K D Duncan** An experimental study of flowcharts as an aid to identification of procedural faults *Ergonomics* 1980 (In Press)

Editor's note See [illegible] Mark [illegible] monthly series on Algorithm Design

●*Dr Brooke is at [illegible] Applied Psychology Unit [illegible] Technology (UWIST) [illegible]*

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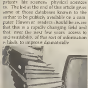
The Searcher

Computer Based Literature Searching

Dr. David Bishop is the Information Officer at the South West Universities Regional Computer Centre (SWURCC) which is based at the University of Bath. SWURCC is responsible for the high speed communications network that links five S.W. university institutions and for an ICL 2980 computer that is the main batch processor in the network.

An important part of any research worker's task is the need to keep abreast of the literature in his chosen field, be it in the arts, sciences or wherever. For example, the postgraduate at the beginning of his project will often need to do a large one-off literature survey in order to establish himself, while a member of staff may wish to be kept routinely up to date with work published in his area. The computer can be of assistance in these sorts of tasks because it is able to do the tedious searching required, quickly and accurately.

There is an astonishing number of databases available for computer based literature searches nowadays, including legal, social sciences, agriculture, patents, life sciences, physical sciences etc. The list at the end of this article gives some of those databases known to the author to be publicly available on a computer. However, readers should be aware that this is a rapidly changing field and that over the next few years access to and availability of this sort of information is likely to improve dramatically.



Many of the literature databases now available developed from the abstracting services provided in many research areas (eg Physics Abstracts). These provide brief printed details of publications in a given field. The scale of some of these abstracting services meant that a computer had to be used for typesetting anyway and so, as a natural extension, the computer-based versions have been made publicly available. This has allowed selected listings tailored to an individual's needs to be provided, rather than a fortnightly or monthly journal which has to be searched manually for relevant articles. However, many other databases are now available and sophisticated searching procedures are available. Individual needs can now be catered for much more easily.

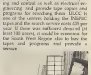
A typical entry in a database will be:

- Author
- Author's institution or affiliation
- Title
- Journal or Publication
- Date
- Abstract and key words

The abstract will usually be the short summary provided by the author at the beginning of most technical articles. The keywords may be provided by the author or by the information officers working for the organisation owning or supplying the database. Material is prepared for the computer either by typing with a special OCR typeface (Optical Character Recognition – as on the bottom of cheques) or with the key-to-disc equipment. After proof reading and validation, the material can be added to the database (a special scanner is used to read OCR typed copy). Most databases are updated frequently and are usually made available to other organisations, often on magnetic tapes.

How then does the research worker gain access to these databases? and particularly if he has no computer terminal or if he knows little about computing?

There are two basic approaches. The first does not require any equipment or particular computing knowledge. You simply provide a 'profile' of your requirements, eg. a list of keywords and journals to be searched. At regular intervals your profile is compared with the database and you are sent a list of relevant articles or entries. Some care must be taken in specifying the profile because it is easy to end up with many hundreds of references. Probably the best known of this type of service is INSPEC (Institution of Electrical Engineers). They publish abstracts of journals in physics, electronics, computing and control as well as electrical engineering, and provide tape copies and programs for searching them. ULCC is one of the centres holding the INSPEC tapes and the search service costs £35 per year. If there was sufficient demand (at least 100 users), it could be economic for the South West Region also to buy the tapes and programs and provide a service.



The main disadvantage of the above approach is inflexibility. One-off searches are difficult and sometimes you may get thousands of 'hits', other times nil.

Over the past two or three years, several organisations have begun to offer *on line searching* of databases. Brief details of organisations known to the author are given at the end of the article. They all offer a range of databases – some of which are exclusive to a particular organisation – but many are available from more than one of these 'information providers'. Access to these on line services requires a computer terminal connected to a telephone line and a knowledge of the language or the commands used for searching the databases (but do not be put off by this, read on).

In principle it would be possible to buy many of these databases for, say, the Multics system, and start a regional service, but the updating of the databases and maintenance of the search programs would require a lot of effort. *It is almost certainly better to rely on the specialist organisations who can spread their costs over a large number of users.* There is intense competition in this area so charges are kept to the necessary minimum. There is generally a small (sometimes zero) registration charge plus running charges which are based on terminal connect time, which databases are accessed, any off line printing and, of course, the cost of the telephone call (which will often be a local call). Having registered with an information provider the user is usually given some training and an hour or two's free time to get to know the system. The search languages are different for each provider but a European Common Command Language is often available as an alternative. This latter set of commands is usually less powerful than the information provider's own language.

Obviously, to use on line literature searching systems efficiently and economically, one has to know *which* information provider to go to, the *relevant* searching language and even to a certain extent the *structure* of the individual databases. The average research worker will not want to get involved at this level of detail and so several large organisations have appointed information officers with special knowledge of search languages and databases and who will do searches for people. Such a service could be provided at a Regional or University level, either by a computer centre or a university library. If you would be interested in using such a service, please let us know. (Write to the SWURCC, University of Bath, Claverton Down, Bath.)

Some Useful Addresses

The following is a list of information providers known to the author. I will be glad to provide further information on any of them but these addresses will allow direct contact.

Brian Kingsmill
Technology Reports Centre
Department of Industry
Orpington
(about 20 scientific and technological databases)

Learned Information Ltd
Besselsleigh Road
Abingdon
Oxford OX13 6EF
(Electronic Components Databank)

BLAISE
7 Rathbone Street
London W1P 2AL
(British Library Automated Information Service. Various, especially medical and BL catalogue)

Mr L J Crossman
Marketing & Customer Services Section
ET 11 2, Alphaze House
Fore Street
London EC2Y 5XA
Euronet Diane (Very wide range of databases covering all EEC countries but not US)

Infoline Ltd
Brettenham House
Lancaster Place
London WC2E 7EN
(Variety of databases expanding, some on-line ordering of booths etc is also possible)

SDC Search Service
Suite 301 bis
28 Bd de Grenelle
75015 Paris
France
(US based, wide variety of databases available)

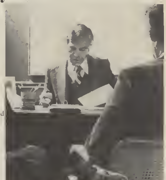
INSPEC Marketing Department
Institution of Electrical Engineers
Station House
Nightingale Road
Hitchin
Herts SG5 1RJ
(Physics, Computing, Electronics, Electrical Engineering, Control Abstracts – batch service)

Publicly available computer based literature databases

The list below gives those databases thought by the author to be generally useful. As there are a lot of quite specialised databases also available, I will be glad to supply further details on request because space does not permit us to give more than the title of the database. Several of these databases are available on more than one computer.

1) Accountants Index
2) Agricola (agriculture and related areas)
3) American Statistics Index
4) Biological Abstracts
5) BioResearch Index
6) Chemical Abstracts
7) Comprehensive Dissertation Index
8) Engineering Index Monthly
9) Conference Papers Index
10) Energy Line
11) Enviro Line
12) Current Index to Journals in Education
13) Resources in Education
14) Food Science and Technology Abstracts
15) Geological Reference File
16) Inform (Business management)
17) Physics Abstracts
18) Electrical and Electronics Abstracts
19) Computer and Control Abstracts
20) ISMEC (Mechanical Engineering)
21) Labordoc (Industrial relations & similar)
22) Libcon (US Library of Congress catalogue)
23) Library and Information Science Abstracts
24) Petroleum & Energy News
25) Oceanic
26) Paperchem (paper industry)
27) Pollution Abstracts
28) Psychological Abstracts
29) Pharmaceutical Literature (Ring doc)
30) Safety Science Abstracts
31) Social Science Citation Index
32) Titus (textile industry)
33) Petroleum Abstracts
34) US Political Science Documents
35) World Patent Index
36) Gas Compounds (Chemical compounds)
37) COMPENDIX (Engineering Index)
38) World Aluminium Abstracts
39) British Education Index
40) Cancer Literature Abstracts
41) Cambridge Crystallographic Data Files
42) OECD main economic indications
43) OECD external trade statistics
44) Plastics, Rubbers Fibres database
45) Evaluated Nuclear Structure Data File
46) MEDLARS (All field of medical literature)
47) ITIS (Business data for 90 countries)
48) UK MARC (British Library catalogue)
49) SUSIC (Sports and sports sciences)
50) Electronic Components Databank
51) Metals Abstracts ■

"A computer, yes, but which one?"



Talking with business friends, I realized we all faced the same dilemma.

We accepted the new technology, but were concerned that we should make rational decisions about computers and word processors, in order that they should do the best possible job for our companies.

I told them how I would soon be solving this problem, at least in part.

The Which Computer? Show

It was simply a matter of putting aside a day or two in November to visit the Which Computer? Show.

For, as I explained, here under one roof and for four days would be hardware, software and consultancies and bureaux.

A forum for the well-managed business

This show was just the opportunity I had needed. There, I could consider all the options, see working computers, talk about software, investigate word processing, and much more.

My friends echoed my enthusiasm.

We have all made firm notes in our diaries.

And of course, I will be seeing them there, spending a day at the Which Computer? Show simply as a businessman who needs to make rational decisions about computers and word processors for the sake of his own company's future.

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Gil Filbey

Cutting queues at a barber shop

A SIMULATION

The discussion which follows is inspired by a book the author was given to review. A FORTH [illegible] will appear [illegible]

The news this month is that I have been experimenting with a new version of FORTH namely FIG FORTH 1 7 FIG stands for FORTH Interest Group (*Computer Age July 1980*) V 1 7 is based very closely on the new FIG model and is a fully disc-based system It is designed to run on Apple II but does not use the normal BASIC oriented DOS Any disc can be initialised and formatted by means of the disc supplied It formats into "screens" of 1024 bytes each, and in the standard system there are about 60 such screens available to the user for programmes The disc is then acting as virtual memory If you are not used to BASIC this represents more disc space then it would appear since all screens are available to all others In FORTH where programmes consist of defined words any words previously defined may be used in the current programme by first loading the screen on which they appear into the dictionary A command to do this can be written on the current screen and a very powerful editor is available when writing screens in the EDIT mode

On this version variable names and FORTH words can be any combination of symbols up to 63 in number and all symbols count There is no time-penalty for this So the procedure is this You first gain access to the screen buffer by typing, say, 42 EDIT, and you are then faced with a blank screen Anything you now type will be entered into the buffer but will of course go no further This enables the screen to be used simply as text and places no FORTH syntactical contraints on you

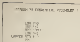
When the page is completed there is a choice of things you can do You can edit it by insertion and deletion If what you have produced are FORTH definitions, and you want to put them on disc then CONTRL E does that To put them into dictionary for running a programme you type 42 LOAD, and this will take your programme off disc into the buffer and then into dictionary There are control commands for missing out the disc save, if you just want to try out your definitions to see if they work If they don t you will get error messages and can go back to screen for editing When you ve got it right you can save on disc If what you have put in dictionary is of a sufficiently global nature so that you feel you will want it available in most future programmes – for example arithmetic routines or display-mode routines such as INVERSE or FLASH – then SAVESYSTEM will put the current dictionary in compiled form on to disc, either this one or any other that has been initiated

At any time (unless you are in EDIT mode) you can put out the displayed text to printer by CNTRL-P which opens the printer prints out and closes it again This has the advantage of not printing irrelevancies such as LIST Furthermore, the printer is off at the end which is something I usually forget to do

An important advantage of the 1 7 version over the 1 5 I was using previously is the FORTH Assembler This enables you to define words using the 6502 mnemonics Words so defined may be entered into dictionary and used in other definitions just as any other FORTH words

Here is a simple example of a program to find the larger of the contents of two memory locations and to store the result. The locations are 40 and 41 (HEX) and the result is stored in 42

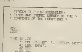
Fig 1 shows the conventional assembler listing, (excluding symbol tables and the like) containing a single branch



```
( SCREEN 78 CONVENTIONAL ASSEMBLER )

         LDA 40
         CMP 41
         BCC LARGER
         LDA 41
  LARGER STA 42
         RTS
```

Fig 1

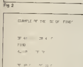


```
( SCREEN 71 FORTH ASSEMBLER)
( FINDS AND STORES LARGER OF THE )
( CONTENTS OF TWO LOCATIONS )


HEX
CODE

 FIND 40 LDA,
   41 CMP, [illegible]
   41 LDA, ENDIF,
   42 STA,
  NEXT JMP
 END CODE
```

Fig 2



```
EXAMPLE OF THE USE OF FIND


3F 40 [illegible] 2B 4 C
FIND
42 [illegible] 3F [illegible]


3F 40 C [illegible] 41 C
 FIND
 [illegible] 3F OK
```

Fig 3

Fig 2 is the FORTH assembler in which the word FIND is defined Typing FIND executes the programme

Now here is the programme in action (Fig 3) The number 3F is first stored in location 40 as a single byte and 2B is stored in 41 Then FIND is executed and the contents of 42 are examined and turn out to be as expected, 3F The second example is one in which the larger number is in 41, namely A8

You will notice the use of IF ENDIF, in the FORTH Assembler There is a large number of such structures available these enable the proper use of structured assembler programming In fact except by the use of low cunning, you can't write unstructured assembler programmes There is no need to use the particular format shown I wrote it like that for clarity You needn t write in HEX either if you prefer not to NEXT JMP is a re entry to FORTH and END-CODE is the terminator

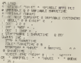
I intend to include an article on the assembler in a later issue and will also enlarge on the merits of the 1 7 version

A book review

I have been reading a new book on simulation and the rest of this article is a review of it together with a FORTH programme to solve one of the simulation problems included in the book There is an interesting and stimulating foreword by Gerald Weinberg who is general editor of the series (*see later part of the article*) issuing a warning on the misuse and abuse of simulation as a technique for solving real problems I would like to add some of my own The problem 'solved'' here in FORTH is the problem as posed in the book.

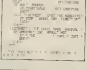
It is an elementary queueing problem A single queue of the first-come first-served variety (FIFO) with a single server For realism the server is a barber and the queue is his customers The factors we are asked to take into account are

- •1 Customers arrive with the Poissonian distribution at the average rate of five per hour ('Poissonian will imply that whilst arrivals are random the expected number in any time interval is proportional to the length of that interval)
- •2 The barber shaves at an average rate of four per hour with a negative exponential distribution
- •3 A number of chairs is provided for the convenience of waiting customers If the chairs are all full it is assumed the new arrival doesn t stay



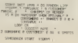
```
( SCREEN 42 BARBSHOP FIRST

45 LOAD
0 VARIABLE CHAVES 0 VARIABLE ARRIVALS
0 VARIABLE Q 0 VARIABLE SHAVETIME
0 VARIABLE CHAIRS
0 VARIABLE SUMSHAVE 0 VARIABLE CUSTOMERS
: QFULL? Q @ CHAIRS @ = ;
: QOK [illegible] ;
: INC 1 SWAP +! ;
: DEC -1 SWAP +! ;
: STARTSHAVE 1 SHAVETIME ! Q DEC
SHAVES INC ;
: STOP 0 SHAVETIME ! ;
: IDLE? SHAVETIME @ 0= ;
: STARTDAY 0 SHAVES ! 0 ARRIVAL ! 0 Q !
 0 SHAVETIME ! ;
: HEADER [illegible] CHAIRS @ [illegible]
CR ." ARRIVALS " ." SHAVES " ." QUEUE
 " 28 ;
: FINISHED? RGET 17 < ;
: CUSTOMER? RGET 21 < ;
 [illegible] 44 LOAD
```



```
( SCREEN 43 BARBSHOP

: BARBSHOP STARTDAY 480 0            MINS/DAY
 DO
  IDLE?                           [illegible]
   IF QOK? RANDOM
    IF STARTSHAVE        [illegible]
    ENDIF
  ELSE FINISHED?   ( DOES THE ROULETTE )
    IF STOP   WHEEL SAY  TIME [illegible]
    ENDIF
  ENDIF
 CUSTOMER? ( THE WHEEL SAYS ARRIVAL )
  IF ARRIVAL INC QFULL? NOT
   IF Q INC          ( TAKE A SEAT )
   ENDIF
  ENDIF
 LOOP
 [illegible]
```



```
( SCREEN 44 BARBSHOP

START INIT 1000 A DO RANDOM LOOP
 [illegible] SUMSHAVE ! 0 CUSTOMERS
CHAIRS ! [illegible] CHAIRS" CR HEADER
 15 0 DO BARBSHOP SHOW ARRIVALS @
        CUSTOMERS +! SHAVES @ 0 @ +
        SUMSHAVE +!
     LOOP CR
        ." SUCCESS RATE  "
 2 SUMSHAVE @ CUSTOMERS @ A0 6 SPACES

 SAMEAGAIN START 15DAYS ;
```

Fig 6

- •4 The remaining queue is served when the shop closes at the end of the day

The programme is an analysis of the problem as posed

Before the simulation is carried out, let s look into the realism of the model The most unrealistic feature is the suggestion that the waiting queue is served at the end of the day The actual question suggested ten chairs are provided This is two and a half hours work at the end if the queue is full! You will see from the result of the simulation that it often is We might consider varying the time of closing shop depending on an estimated time to finish the queue Further refinements could be a probability that an arrival would stay dependent on the existing queue length and the probability that a seated customer would remain longer than a stated time if not served in that time All these considerations are to some extent quantifiable even to the inclusion of a television set to induce arrivals to remain! (Although how many would leave, served or not when Match-of the-Day finished is another question)

Perhaps these questions are not relevant to abstract queing theory but they are to real-life queue practice I know of a canteen in which a firm of consultants instituted a system of parallel queues You chose your queue by studying a displayed menu before entering Some of the problems which arose were as follows

- •1 If your chosen menu was off before you reached the counter what was the ethics of queue changing?
- •2 To get out of your queue when served you had to break through several others with a tray full of spillable goodies to get to the pay desk
- •3 You are in the queue for steak-and-chips or steak and mashed The queue has ground to a halt because chips are off You *don t* want chips How do you get the message (except by bitter experience) or you *do* want chips but will settle for mashed if it means too long a wait ?

What has all this rubbish got to do with mathematics? Let s get back to abstract queing theory where life is relatively simple The BARSHOP programme is here displayed on 3 screens starting at 42 This screen starts by the command to load 45, which is an arithmetic routine for evaluating the answer at the end Then, certain necessary variables are defined and initialised to zero

The variable SUMSHAVE and CUSTOMERS are the totals of those served and those arriving in a 15-days period of 480 mins/day I think the rest of the variables are self explanatory

The word QFULL? asks if the number in the queue equals the number of supplied chairs

QOK? asks if there is anyone waiting to be shaved (a question necessary if the barber is idle)

FINISHED? gets a random number out of 255 and compares it with 17 This is expected to be true 1/15 times i.e four times per sixty minutes if each throw represents a minute of lapsed time

CUSTOMER? will be true five times in sixty minutes on the average

Screen 43 is the main BARSHOP programme of 480 loops each representing one minute of the working day

The word RANDOM after QOK? requires explanation. It is simply a dummy random number which is thrown and not used in the event of the queue being empty. This is simply to ensure that precisely the same set of random numbers is thrown from the same seed whichever branch of the conditionals is taken. This is thought by some to be a good thing. I doubt it but conform to majority decision.

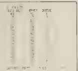


Fig 7

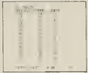


Fig 8

The final screen 44 works by typing SAMEAGAIN which will always do a 15 day run from the same initial seed. However, 15DAYS will do a run from the seed you are left with so the scatter on results may be evaluated. The word START initialises the random number and runs off 1000 of them to mix things up (but in an entirely reproducible way). Notice that screen 42 contains instructions to load the others.

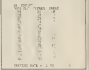


Fig 9

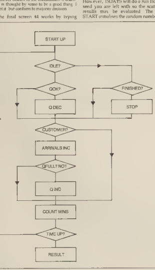


Fig 10

Figs 7 and 8 show the effect of using the same random number seed (SAMEAGAIN) in different situations. The same daily arrival pattern recurs.

Fig 9 repeats the ten chair case with a new seed and so quite a different pattern of arrivals. There is, however, little change in the final result – which shows the reliability of the Monte Carlo method. Since the barber shaves customers, on the average, at a slower rate than they arrive he is seldom faced with an empty queue so the number he gets through before the shop closes is little dependent on the number of chairs. If you simply take into account only those shaved in the 480 minute day, the success rates for the two chair and ten-chair cases are 0.66 and 0.71 respectively, so that most of the advantage stems from the captives at the end of the day. This requires an average of one and a half hours a day extra work. Fig 10 is a flow-chart of the problem.

The problem was taken from:

Simulation	**Principles and Methods**
Authors	**Wayne and Pooch**
Publisher	**Prentice-Hall (Winthrop Computer Systems)**
Pages	**250**
Price	**£12.55**

The book is a clear presentation of all the usual methods and techniques and doesn't include too much mathematical proof. For example, the various statistical distributions and their uses are presented as statements of fact, but the reasons for the choice of one rather than another are always made clear. Problems are presented (of which one has been treated above) the reader is asked to write programmes in general purpose languages such as FORTRAN or PL/1 and in a number of special purpose languages, the structures of which are discussed in some detail. There is also a chapter on continuous system simulation and analogue computing.

A worthwhile book, even if the presentation is somewhat *ad hoc* in places.

FORTH ver. 1.7 is at present available from Cap'n Software, P O Box 575, San Francisco, CA 94101.

The version is expected to be available from Personal Computers Ltd, 194 Bishopsgate, London EC2. ■

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IVERSON'S LANGUAGE

Tabular Data

Tabular Data

We begin by constructing the 8 times table First locate the jot character (shift J) and enter

```
      TABLE←(ι8)∘.×ι8
      TABLE
1    2    3    4    5    6    7    8
2    4    6    8    10   12   14   16
3    6    9    12   15   18   21   24
4    8    12   16   20   24   28   32
5    10   15   20   25   30   35   40
6    12   18   24   30   36   42   48
7    14   21   28   35   42   49   56
8    16   24   32   40   48   56   64
```

Now enter

```
           ρTABLE
      8 8
```

The shape yields a vector In the case of a table – or matrix – two numbers are displayed denoting the number of rows and the number of columns respectively The primitive function outer product used to construct a table, will be discussed further at the end of this chapter Needless to say this is a very powerful primitive

Tables are more commonly constructed by means of the dyadic ρ (reshape) encountered earlier Enter

```
          3 4 ρ ι 12
1       2       3       4
5       6       7       8
9       10      11      12
```

The vector ι12 is utilised in row order

Before proceeding practice the following examples

EXERCISE

1 Enter

```
      X←2 5 ρ'TEXT ARRAY'
```

2 Enter

```
      Y←10 1 ρ'X'
```

3 Enter

```
      Z←3 4 ρι4
```

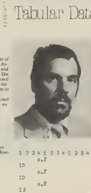
4 What are the shapes of X Y and Z?

UNRAVELLING A MATRIX

You will recall the dyadic function catenate, which is the simple comma Used monadically it is termed ravel – although unravel is a more appropriate term

X Y and Z are as in the exercise above

```
          ,X
  TEXT ARRAY
          ,Y
  XXXXXXXXXX
          ,Z
1 2 3 4 1 2 3 4 1 2 3 4
          ρ,X
  10
          ρ,Y
  10
          ρ,Z
  12
```



Monadic comma has 'unravelled' the matrix Note that the unravelling is done in "row-major" order, so that in reading the unravelled matrix from left to right you encounter the elements in the same order as you read the matrix itself – ie from left to right and from top to bottom

There is an important property of ravel it always returns a vector Thus

```
            ρ5
```

(APL returns a blank line)

```
            ρ,5
      1
```

RULES FOR SCALAR DYADIC PRIMITIVES WITH TABLES

The rule for combining matrices is the same as for vectors and scalars so we formulate it generally

If 'f' denotes a scalar dyadic function (such as +−×÷⌈⌊) and A B denote variables or constants, then in

```
      AfB
```

A and B must be the same shape or A or B must comprise a single element

Exercise

Enter

```
      A←3 4ρ?12ρ50
      B←3 4ρ10+ι12
      C←2 6ρA
```

and check that you understand the following results

```
      (a) 100 + A
      (b) A + B
      (c) B ÷ A
      (d) (,A),,C
      (e) A, C
      (f) A + C
      (g) B × 20
```

Solutions

- (a) 100 is added to every element of A
- (b) corresponding elements of A are added
- (c) corresponding elements of B are divided by elements of A
- (d) A and C are unravelled, and catenated
- (e) ERROR
- (f) ERROR
- (g) every element of B is multiplied by 20

REDUCING A MATRIX

Reduction is also performed on tables but here we have a choice do we wish to reduce rows or columns?

Enter

```
      A←3 3 ρ1 0 3 5 6 2 9 8 9
      A
1    0      3
5    6      2
9    8      9
```

Now enter

```
            +/A
      4 13 26
```

The reduction is across columns so that +/A is a vector each component representing the sum of a row

1 A as above

- (a) enter ×/A
- (b) enter ∨/A>5
- (c) enter ∧/A/5
- (d) enter ⌈/A

Solutions

- (a) product across columns 0 60 648
- (b) 0 1 1 – row 1 has no elements>5 the others have at least one
- (c) 0 0 1 – only row 3 has all elements>5
- (d) 3 9 9 – the largest element in each row

SELECTION

Selection applied to matrices works by

```
APL:     ρ(dyadic)  ← ∘ ×  ρ(monadic)        APL:    ←dyadic ρ  monadic ρ  ι  A-Z
ASCII:   reshape    _ J #    shape           ASCII:  _reshape   shape      I  a-z
```

selecting rows and columns rather than elements

Enter

```
        1 0 1/A
    1 0
    5 2
    9 9
```

Consistently logical reduction operates on columns so that the 1 0 1 reduction selects the 1st and 3rd columns

To operate on rows we indicate that we wish to operate on the first dimension rather than the last In APL rows are equated with the first dimension columns with the second Thus enter

```
        +/[1]A
15 14 14
        1 0 1/[1]A
1 0 3
9 8 9
```

Thus we index the reduction operator itself with the dimension number to be reduced If however this is omitted then APL assumes that the last dimension is to be reduced

Exercise

- (a) enter ×/[1]A
- (b) enter ∨/[1]A>5
- (c) enter ∧/[1]A>5
- (d) enter ⌈/[1]A

Solutions

- (a) product across rows 4 5 0 54
- (b) 1 1 1 all columns have at least one element>5
- (c) 0 0 0 all columns have at least one element≤5
- (d) 9 8 9 maximum element in each column

ILLUSTRATIVE EXAMPLES

The prices of three articles in four regions are summarised by the matrix PRICE

```
      PRICE
[illegible]   4.06   4.1   3.97
1.5   1   [illegible]   1.82
[illegible]   9.[illegible]   10.5[illegible]   10.95
```

*What are the new prices if there is an across the-board increase of 10% Enter

```
      PRICE×1.1
[illegible]   4.466   4.51   [illegible]
[illegible]   [illegible]   2.[illegible]   [illegible]
[illegible]   10.945   [illegible]   [illegible]
```

*If each article is increased by 10 pence (0 10) what are the new prices?

```
      PRICE+0.1
[illegible]   4.16   [illegible]   [illegible]
[illegible]   [illegible]   1.[illegible]   [illegible]
[illegible]   10.[illegible]   11.[illegible]   11.05
```

*What is the average price of each article?

We do this in stages

```
      TOT←+/PRICE
      AVE←TOT÷4
      AVE
4.02 1.7975 10.22
```

*What is the maximum price of each article?

```
      ⌈/PRICE
4.1 1.82 10.95
```

*Excluding region 3 what is the average price?

We will do this in stages, also

```
      EXC3←1 1 0 1/PRICE
      TOT←+/EXC3
      AVE←TOT÷3
      AVE
3.9933333 1.79 9.9766666
```

*If I purchase one of each article from each region, what is the lowest total price?

```
[illegible]
```

Before proceeding with the next example, satisfy yourself that you understand each step

Exercise

Using the sales data above the volume of sales (thousands) is summarised as follows

```
      VOLUME
[illegible]   9.[illegible]   19.[illegible]   [illegible]
[illegible]   [illegible]   [illegible]   [illegible]
[illegible]   12.[illegible]   [illegible]   [illegible]
```

*Construct the logical matrix indicating receipts exceeding £80000

```
      LOG←80<VOLUME×PRICE
      LOG
1 0 0 1
0 0 0 0
0 1 1 1
```

*are there any regions where no single item has receipts more than £80000?

```
      ∨/[1]LOG
  1 1 1 1
```

so all regions have at least one product bringing in £80000

*are there any products not bringing in £80000?

```
      ∨/LOG
  1 0 1
```

so product 2 does not bring in £80000 anywhere

*Drop from PRICE all products not bringing in £80000 anywhere

```
      1 0 1/[1]PRICE
[illegible]   4.06   4.1   3.97
[illegible]   9.[illegible]   10.95   10.95
```

EXERCISE

1 Using PRICE and VOLUME as above display the matrix of receipts call it INCOME

2 Construct a matrix LOG, showing where receipts lie between £70000-£100000

3 For each region, list the number of products with receipts between £70000 £100000 (This involves plus reduction of LOG)

4 Display the new INCOME matrix (call it NEWINC) if prices increase uniformly by 12% and sales drop uniformly for each product by 6% in region 1 15% in region 2, 13% in region 3 and 14% in region 4

(Hint The percentage drop in sales is given by 3 4⍴6 15 13 14)

5 Display the logical matrix giving a 1 where the new income is greater than the old

6 Has the increase in price resulted in a drop or increase in total income? (ie for all products and all regions)

INDEXING MATRICES

Matrices are indexed in the same way as vectors, but here we must provide two index sets one for rows one for columns We illustrate with an example

```
        PLACES
  EXETER
  LONDON
  SHEFFIELD
  ST COLUMB
  YORK
  GT YARMOUTH
  TORQUAY

        ⍴PLACES
  7 11
```

PLACES is a 7 x 11 character matrix Enter

```
        PLACES[6;]
  GT YARMOUTH
```

– the sixth row is displayed The semicolon is necessary for matrices to separate the index set for rows from that for columns The column index set is left blank and this means select all columns Now enter

```
        PLACES[5 4;]
  YORK
  ST COLUMB
```

– the 5th and 4th rows are displayed in that order

```
APL:    monadic ρ  dyadic ρ   ⍳ ⍎ ×     APL:    ← ρ dyadic × ∨ ⌈     APL:     × ∨ ⌈
ASCII:  shape      reshape    I ⍎ #     ASCII:  _ reshape  # & S     ASCII:   # & S
```

```
      PLACES[;1]
 ELSSYGT
```

– the first column is displayed. Here the row index set is left blank, which indicates that all rows are to be selected

```
      PLACES[3 2 1;1 2 3]
 SHE
 LON
 EXE
```

– the first three columns are displayed of rows 3 2 1

The rules are as follows.

A semicolon separates row index set which is before the semicolon from column index set

A blank entry before the semicolon indicates that all rows are selected; a blank entry after the semicolon indicates that all columns are selected

The index set comprises integers from 1 to the number of rows or columns as appropriate in any order and duplicated as desired

The shape of the result of indexing is the shape of the row index set catenated with the shape of the column index. (The shape of a blank entry for this purpose is the number or rows or columns, as relevant.)

This last rule needs clarification. Enter

```
      ρPLACES[1;2 3]
 2
      ρPLACES[1 2;2 3]
 2 2
      ρPLACES[1;3]
```

(APL returns a blank line – the null vector)

The reasons for these results are

- 1 has no shape 2 3 has shape 2 and nothing catenated with 2 is 2
- 1 2 is a 2 vector 2 3 is a 2-vector. Thus the shape of the result is 2,2
- 1 and 3 are both scalars and neither has any shape. Therefore the result has no shape.

Parts of a matrix may be reassigned using indexing. For example

```
   PLACES[6;]←'BRISTOL
```

The right side must be filled out with blanks, otherwise –

```
      PLACES[6;]←'BRISTOL'
 LENGTH ERROR
      PLACES[6;]←'BRISTOL'
         ∧
```

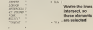
APL Series

```
      PLACES
 EXETER
 LONDON
 SHEFFIELD
 ST COLUMB
 YORK
 BRISTOL
 TORQUAY
```

In general, as we have seen, the shape of the left side must be the same as the right side in indexing. The exception is that the right side may be a scalar eg

```
      PLACES[;11]←'?'
      PLACES
 EXETER     ?
 LONDON     ?
 SHEFFIELD  ?
 ST COLUMB  ?
 YORK       ?
 BRISTOL    ?
 TORQUAY    ?
```

Understand the following diagram and you will have no difficulty in indexing



Where the lines intersect, so these elements are selected

Thus illustrates

```
      PLACES[1 7;1 11]
 E?
 T?
```

OUTER PRODUCT

We conclude this session with an interesting and powerful primitive called outer product. You will recall that you keyed in (ι8)∘.×ι8 and produced the 8 times table. In general every element on the left is combined with every element on the right. If as in the example above the primitive involved is × then every pair of elements are multiplied.

Let us try a few examples

```
      'ABC'∘.='ABC'
 1 0 0
 0 1 0
 0 0 1
```

Why this result?

Well, first we combine the first element of the left argument namely A successively with the elements of the right. This forms the first row

```
      'A'='ABC'
 1 0 0
```

Next the second element of the left argument is combines with the right argument namely B = ABC which produces 0 1 0. Finally C is compared with ABC to produce the third row

One more example

```
      1 2 3∘.+0 1 2 3 4
 1 2 3 4 5
 2 3 4 5 6
 3 4 5 6 7
```

You will perhaps be able to interpret this result yourself

An interesting rule applies to outer product shape

The shape of the result of outer product is the shape of the left argument catenated with the shape of the right argument

Compare this with the last rule for indexing matrices

Outer product can be used with any scalar dyadic primitive

EXERCISE

1 Interpret the following expression

```
      (ι6)∘.≥ι6
 1 0 0 0 0 0
 1 1 0 0 0 0
 1 1 1 0 0 0
 1 1 1 1 0 0
 1 1 1 1 1 0
 1 1 1 1 1 1
```

Produce the following patterns

2 Using reshape created the following matrix

```
      MAT
 CAT
 SAT
 ON
 MAT
```

(a) Select rows 2 and 3
(b) Select column 2
(c) Using plus reduction, equals, and ravel find how many times the letter A occurs ■

■ *Alan Pearman [illegible] PI H [illegible] API [illegible] puter the MAPLE*

APL:	× ÷ ⌈ ←	APL:	⌊ ← × A-Z	APL:	ρ dyadic	APL:	A-Z
ASCII:	# % S _	ASCII:	D _ # a-z	ASCII:	reshape	ASCII:	a-z
APL:	ρ monadic ←	APL:	←	APL:	ι ∘ ×	APL:	ι ∘ ≥
ASCII:	shape -	ASCII:	_	ASCII:	I J #	ASCII:	I J }

HAL COMPUTERS

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HANDLING DATA

Part III: Computed Addressing

Previous articles in this tutorial series dealt with sequential and indexed sequential files

The process whereby given a key you are able to retrieve the record *corresponding* to that key can be shown by means of the diagram **Figure 1**

An algorithm is used to relate the key of a record with its address or position in a file (In this series of articles I use the record number as an indication of a record's position)

In the first article of this series (Issue 9) the algorithm used entailed searching sequentially through a file in the second article (Issue 10) indexes were used with an algorithm to enable rapid retrieval to take place The disadvantage of using indexes is that they do take up a lot of space Ideally we would like to be able to *calculate* the position of a record given its key Since a simple calculation takes less time than a search of an index then a very rapid response to retrieval requests will occur The calculation of a record's address or position is the basis of what is known as **computed addressing** or **hashing methods** in file processing

In order to illustrate this I will use a very simple example of a file of records where the key number varies from 1 to 999 I will assume that no more than 20 of these records are held in a file at one time therefore I shall set up a file whose initial size is 20 records Thus file at the start of processing contains no records The calculation I shall use to determine a record's position in a file is

'take the key find the remainder upon dividing by 20, and add 1'

Thus the record with the key 33 will be mapped onto record number 14 in the file The first step is to fill the file with records

Table 1 Illustrates this mapping for seven such records

Key	maps to	record number
33	→	14
876	→	17
42	→	3
15	→	16
903	→	4
87	→	8
190	→	11

TABLE 1

Assume that the keys are the *works numbers* of employees in an enterprise and that the seven employees of Table 1 have been placed in the file at their respective record numbers The occupancy of the file is shown in **Figure 2** The shaded records are empty that is they contain no employee record

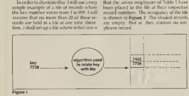

Figure 1

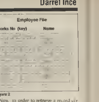
Employee File
Works No (key)
Name

Figure 2

Now in order to retrieve a record corresponding to a key all that is needed is to apply the calculation previously described Thus if we wished to retrieve the record corresponding to key 876 •we find the remainder on dividing by 20 (=16) and add 1 •the record will be at position 17 •we can now retrieve the record directly by

Read direct (17)

This method seems very attractive However there are a number of complications The major complication is due to records which map onto a space already occupied by another record For example we may wish to insert a record with a key of 107 into the file Using the calculation this is mapped onto position 8 in the file However position 8 is occupied with a record whose key is 87 This occurrence is called a *collision* As well as having a method for calculating record addresses we must have a method for resolving the problem of collisions

A simple method is •once a collision has occurred •search the table from the position of the collision looking for an empty position

Our collision has occurred at record 8 so, the next available position is record 9 – at which the record is placed The actual search for an empty position will continue at the start of the file if the search finishes at the end of the file In order to illustrate collision handling I will insert the records

39	TIMMS	U
75	THOMAS	L
48	WILSON	F
13	VOWLES	S
33	PALMER	V
3	WILTON	R
198	ROBB	V

into the file See whether you agree with me as to where they should be placed The final state of the employee file is shown in **Figure 3**

Because collisions occur in any computed addressing method, the algorithm for retrieval has to be modified We must first calculate the address as we've done previously but then we must search sequentially through the file until we encounter the record that we are going to retrieve Normally we wouldn't need to search more than two or three entries, so that re

▶ Continued on page 55

BRAND NEWs

compiled by Microspy
with Anthony Esgate

11

This middle section may either be pulled out or photocopied then filed for reference It will be comprehensive and range over the whole field of products services events and courses **PU** stands for Personal User **SB** stands for small base – that is small budget or small business **MB** – medium base medium budget or medium business **BB** – big base big budget or big business **Addresses** are to be found at the end of **Brand News.**

Systems

ABIES INFORMATICS

PATIENT REGISTER SYSTEM first phase of integrated practice information system Provided complete with MICKIE patient interviewing system and word processing software Each patient record contains basic information plus 64 characteristics (medical clinical social family or environmental Implemented on SWTPC/09 computer with 64K RAM dual 8 floppy discs V D U and printer Up to 8000 patients can be held on single floppy disc 6500 patients can be held on 16Mb Winchester disc **Dottore (SWTPC)**

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ALMARC DATA SYSTEMS

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Attache Business System

CITY COMPUTER SYSTEMS

EQUITY INFORMATION SYSTEM (E I S) developed on P D P 11 to give dealers on line access to equity database Transactions are entered automatically checked and then stored for immediate enquiry and printing of the equity transaction ledgers Terminal displays show details of clients stockholdings price movements performance figures for companies sectors and markets **City Dealers**

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ATTACHE BUSINESS SYSTEM replacement for Mark I utilizing all Mark I software £8000 bundled system includes 64K Z80 processor twin single sided dual-density disks (1 2 Mb storage) Lear Siegler V D U (24 lines 80 columns) Lear Siegler printer (180 cps) Also Order Entry Order Processing Invoicing Stock Control Sales Analysis Sales/Purchase/Nominal Ledger Bill of Materials Processor Address Book Mailing System and Word Processing software Options include Daisy Wheel printer (£500) Lear Siegler ADm dimming V D U (£250) double sided double density disks (£500) 10Mb Winchester disk (£3500) Operating system is single terminal mode CP/M Multi terminal enhancement under

Ult mate [illegible] Data Processing Systems Ltd

MFM should r[illegible] [illegible] months **MB**

ELECTRONIC DATA PROCESSING LTD

has formed a new operating company EDP SYSTEMS LTD to market the ULTIMATE computer in the U K Ultimate system is an implementation of the PICK OPERATING SYSTEM on the Honeywell Level 6 which is fully compatible with CMC REALITY system EDP's INTERFACE applications software packages originally implemented on REALITY will be marketed for Ultimate Hardware maintenance will be provided by Honeywell Hardware configuration can include a mass storage sub system with up to 68 Mb housed in a single cabinet and tape decks with 3600 ft reels **MB BB (CMC EDP)**

FACIT

D12 A[illegible]COUNTING MACHINE Offers full range [illegible] including sales and purchase [illegible] payroll and administrative routines Can be upgraded by addition of a magnetic card option or COBOL based floppy disc system to handle stock control statistical analysis and reporting **SB**

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BASIC FOUR SYSTEM 510 middle of the range model Intended for use by first time user without specialised computer staff Instantaneous update and/or retrieve All information stored on on line data files 40Mb of disc storage provided (2 x 20 Mb drives) with option to expand to 300 Mb One V D U and 160 character second printer included in bas[illegible] system About £35000 **MB BB**

BRAND NEWs

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NORTHERN BUSINESS SYSTEMS

OLIVETTI and CADO specialists in Yorkshire state that the basis of business systems is to automate preparation of accounts VAT payrolls and documentation Done in a fraction of the time of manual methods paper work flows more quickly and staff are free for other duties **MB**

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MOISTURE COMPUTER for determining the moisture content in grains seeds and other crop commodities Gives automatic digital readout and is programmed for 30 different cereals No weight or temperature measurement nulling of dials looking up of calibration charts or grinding of sample required WINNER OF BRITISH MICROPROCESSOR COMPETITION **Agricultural**

Applications

COMART

RPG II available [illegible] MFM[illegible] with minimum 41K memory Model[illegible] IBM System/3 RPG II implementation Cromemco RPG II is a powerful report generator and programming language Package includes CDOS operating system compiler and editors together with documentation **MB (CROMEMCO)**

CRELLON

PASCAL COMPILER for MOTOROLA 6809 based development system User's guide describes method of calling assembly language routines and also shows how assembly language routines can call a Pascal procedure Code generated by compiler executes significantly faster than interpreted code **Systems Designers (6809)**

The new MA B[illegible]

DATABANK

Offers total of 7 business 2 mathematical and 9 games packages for Apple II ITT 2020 and PET Each program is disc based and will store on disc when necessary **PU, SB (Apple/ITT/PET)**

DORIC COMPUTER SYSTEMS

Distributor of HENCO INC's INFO relational database management system and query system for use on Prime and Honeywell Level 6 systems plus new systems for IBM & IBM compatible mainframes In basic form INFO provides data entry update query language report generator and programming facilities **BB (Prime Honeywell IBM compatible)**

ECONOSOFT

Specialists in ZX80 software C1 cassette containing 4 games programs SIMON a test of memory which automatically adjusts to your skill MINDBENDER a test of deductive logic with up to 6 pegs and 10 colours FRUIT MACHINE combines luck and skill at selecting optimum hold options DESTROYER a simulated ship has to be manoeuvered to a target £5 each cassette inc VAT and operating instructions **PU (ZX80)**

FILETAB SUPPORT SERVICES

New on line version of RAPID READER available for PDP11 users Full conversational and query language produces management reports statistics and listings for managers accountants etc Menu driven for ease of use by non-technical personnel Full arithmetic functions allow record selections and conditional processing to be performed RAPID READER currently provides support for commonly used data files such as ASCII Sort Compatible and record I O Various levels of security are included Runs in either interactive or batch mode under RT11 RSX or RSTS E **MB BB (DEC)**

ICL

INFORMATION PROCESSING ARCHITECTURES (IPA) provides a standard method of linking together a wide variety of computers and terminals using brand new facilities procedures and tools which comprise the latest in telecommunication facilities Allows users to design their applications not only for individual computer systems but also for distribution over the best combination of large and small machines in networks linked by the most effective telecommunication facilities Introduces three new factors standard facilities for exploiting interconnected computers standard procedures for linking computers via telecommunications lines or networks standard tools for creating and maintaining information processing systems **BB (ICL)**

LION MICRO COMPUTERS

Series of software packages for Piping Engineers written for Commodore PET Five programs GAS ONE calculates critical properties of natural and associated gas mixtures PIPELINE LIQUID (1) calculates the pressure drop and power requirements of a liquid carrying pipeline using up to 5 pumping stations PIPELINE (1) calculates pressure drops head and power requirements of a gas pipeline with up to 5 compressor stations CENTRIFUGAL COMPRESSOR PROGRAM calculates the expected performance of a centrifugal compressor CENTRIFUGAL

PUMP calculates the expected performance of a pumping duty using a centrifugal pump. Each program contains a menu system to facilitate data input and output. Operator is guided interactively. **Piping Engineers (PET)**

MEDICOM

PRACTICE MONITOR to improve gp's handling of the disease index, age/sex registers and in particular the way that diseases are audited and long term diseases managed. Monitors high risk patients, records all procedures due for fee claims, forms a list of patients for recall, analyses practice workload by age/sex/Dr/disease, analyses disease patterns and association, prescribes patterns, monitors repeat prescription, monitors new drugs and other treatments, evaluates trainee programme. Implemented on 32K Commodore with cassette deck. **Doctors (PET)**

MICROPLAN

FPL financial planning package. Will support both ongoing reporting requirements and modelling applications. When used for reporting stores all previous data in format allowing entry on regular timetable of new data and production of new reports. Production of comparisons and forecasts is well supported. In modelling allows decision maker to test hypotheses, vary assumptions and ask "What if?" FPL user describes rows, columns and initial data required plus formulae relating his data elements. Runs on any CP/M machine. **MB**

MICROSCOPE

MICROSPACE, a real time reservation and booking system for the travel and holiday industry. Also MICROCOST, a contracts ledger system including sales and purchase ledgers for building contractors. **Travel Industry/Building Contractors.**

NCC

USERTAB English-language enquiry and reporting package enabling users to write their own programs with little or no computer training or knowledge. Continues advances made by FILETAB in increasing the productivity of computer departments by reducing time spent on programming for report generation and information retrieval. Written for NCC by FSS Ltd. USERTAB will be available for IBM & ICL (non VME B) initially followed by VME/B later. **BB (IBM ICL)**

NCR LTD

New version of TRAN PRO transaction processing monitor is a comprehensive set of software modules designed to perform many of the complex tasks involved in processing information in an on line, real-time computer network. These tasks include security handling, scheduling, logging messages, interfacing between applications programs and database management systems, back-ups, restarts and recovery, handling of terminal screen formats and the editing and validation of data. Runs under NCR's virtual resource executive (VRX) operating system on large V 8555 computers and above. VRX TRAN PRO interfaces with the NCR TOTAL database management system and costs from £3000. A new enquiry processing system, TRAN QUEST, is available which allows users to obtain information from a computer system using English like statements. Can also be used for system documentation. Operates with TRAN PRO and NCR TOTAL. **BB**

BRAND NEWs

PACKAGE PROGRAMS LTD

Has announced availability of 3 of its financial application packages on Prime equipment. They are: MMS General Ledger and Financial Reporting System, PPS PAYROLL AND PERSONNEL SYSTEM and the PPC ACE ASSET CONTROL AND EVALUATION SYSTEM. They join IFPS Interactive Financial Planning System, which has been available on Prime for some time. **MB, BB (Prime)**

PENTAGRAM

SAPHIRE package for fixed assets accounting including SSAP16 requirements. Compatible with almost all computer systems. Handles the building and maintenance of a detailed assets register, handles depreciation on a current cost accounting basis and caters for all adjustments to the Profit and Loss and Balance Sheet. **MB, Accountants**

PETSOFT

MicroPools, program which enables author John Minshull to make regular modest wins on the football pools, is being marketed for the Commodore PET, £20 from ACT. **PU (PET)**

PLANNING RESEARCH CORPORATION

COMMERCIAL ACCOUNTING SYSTEM available with PRC's range of minicomputers. Handles Purchase, Sales and Nominal Ledgers, interfaces with other systems such as stock recording, order processing and payroll. Options provide for management information, monthly budget analysis and automatic payment facilities. **MB, Accountants**

RAPID RECALL

ICU 80 software package enables microcomputer systems employing Intel's RMX-80 multi tasking operating system to be configured interactively form the keyboard of an Intellec development system ... speeds development of RMX 80 software and removes some of the restrictions imposed by manual methods. Nucleus, some standard utilities and a number of task handling program modules written by user form final application package. When user supplied task modules are written, ICU 80 creates entire package interactively (ie asks for details of system hardware, user written modules and information exchange). Output is in 3 files: configuration object module, controller addressable memory module and a submit file. ICU 80 requires a 64K Intellec development system with 2 single density disc drives or one double density disc drive and the ISIS II operating system, version 3.4 or later. **Systems Designers (Intellec)**

PETSOFT MicroPools in action

SOUTHWEST TECHNICAL PRODUCTS (COMPUTERS) LTD

AUTOTEXT word processing and filing software for use on recently introduced S/09 microcomputer. Handles names and addresses, text, overdue accounts, letters etc. Labels and envelopes can be printed and documents produced independently. Other information can be held on file and recalled but suppressed from printouts. Minimum configuration required: 56Kb processor, terminal, mini floppy discs and daisywheel printer (runs additional SWTCP software). **MB**

SYSTEMATICS INTERNATIONAL

Is to market the EASYWRITER office automation system. Comprises two basic software modules and a hardware board to interface to APPLE or ITT 2020 microcomputer. Performs full text editing, letter writing and direct mail applications (with optional daisywheel printer). First module is EASYWRITER PROFESSIONAL word processing module. Written in FORTH, it features adding, inserting, deleting, correction of existing text, vertical horizontal scrolling, string/word searches, block movement, word wrap around and right centre screen justification, 80-column character format, uses Qume, Diablo or Spinwriter daisywheel bidirectional printers. Second module is EASYMAILER which offers con

A typical SWTP microcomputer set up for operating the AUTOTEXT filing and word processing business system tinuous letter writing Features single key stroke menu driven commands and multi-field insertion within text In conjunction with EASYWRITER user has database facility with which to define own record format entry update and editing £500 for software and board £4500 for complete system including Apple ITT S W board and daisywheel printer **SB MB (Apple/ITT)**

TEXAS INSTRUMENTS
COMPONENT SOFTWARE products to support TMS9900 family of 16-bit microprocessors and TM990 microcomputer modules Complements TI s microprocessor Pascal products to provide two methods for reducing programming costs and total software costs Initial products in range are REALTIME EXECUTIVE & FILE MANAGER for use on floppy-based microprocessor development system or on multi user hard disc based development system AMPL **Systems Designers (Texas Instruments)**

Printers

Silentype Printer for the Apple I

APPLE
SILENTYPE THERMAL PRINTER specially designed to complement the text editing and graphics capability of the Apple II or Apple II Plus (min 16K) system Silentype package includes printer interface card roll of heat sensitive paper operation and reference manual and warranty card Prints up to 40 characters/sec in text mode 80 char line length 10 char/inch nominal horizontal spacing 6 char inch vertical In graphics mode 7 dot thick film printing element with 240 columns of 7 dots each print rate and 480 dot line length gives nominal resolution of 60 dots/inch horizontal and vertical Full upper and lower case 95 ASCII character set with special control codes for high resolution page turning the screen on and off and printing contents of Silentype buffer Sole distributor MICROSENSE **PU SB**

COLDATA
is to market DATA PRINTER CORP s range of band and chain/drum printers and provide full spares and maintenance support Coldata will also be marketing the DATAPRODUCTS B SERIES range of band printers with controllers interfaces for all major computer manufacturers as well as memory products from MONOLITHIC SYSTEMS and IBM compatible controllers from SCD **MB BB**

DATA DYNAMICS
ZIP FAZ3 intelligent terminal with printer VDU keyboard microprocessor and storage facilities in a single unit Can be used as communications terminal or self contained local processor Data preparation and processing can be carried out locally prior to sending that data via a CCITT V24 (RS 232) or 20 mA current loop interface to a host computer Using floppy disc drives ZIP FAZ3 can operate in real time mode with the operator whilst operating in batch mode with the host computer Asynchronous transmission of data can be set at speeds between 110 and 2400 baud full or half duplex with parity and stop bits switch selected as required 12 VDU presents green characters in 7*5 dot matrix format with either 12 or 24 lines of 80 characters Printer produces full upper and lower case ASCII characters in 7*5 dot matrix format on standard teletype paper Internal print buffer ensures that true 30 cps print rate (10 cps if required) is maintained **MB, BB**

DATA TYPE TERMINALS
following UK distribution agreement with FLORIDA DATA CORPORATION market two new matrix printers the Model 600A and Model 600BNY Feature magnetic stored energy™ print head design giving printing speed of up to 600 characters/second (240 lines/minute for full 132 char lines and over 1000 lines/minute for shorts lines BNY also offers medium/speed printing at 150 cps two pass printing to create solid fonts and graphics Both are Centronics and Data Products compatible with RS232 serial interfacing optionally available Microprocessor controlled with 390 char (16 line) buffer Print format is 8*7 matric with upper and lower case letters including descenders
A model offers standard 96 char font with range of styles faciliated by re programming the ROM Spacing is 10 char/inch and 6 lines inch with compressed type at 16 5 cpi and a switchable facility between 6 and 8 lp as option BNY offers a range of additional features suited to solving small system printing problems Up to 4 fonts can be stored by BNY under switch of program control into directly addressable mode with 128 dots/inch horizontal nd vertical resolution BNY also offers switch or program selection of expanded block generator characters 2 4 or 8 times normal size Model 600A costs £2175 Model 600BNY £2550 **BB**

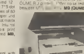
IMPECTRON LTD
Model 88T bidirectional impact printer designed specially for the general small scale computer market 100 cps on roll paper fan fold forms or cut sheets Adjustable tractors allow printing on pre-printed forms or continuous tables from 1 to 9 5 in width Easily inserted long life ribbon cartridge Selectable character densities allow formatting of output in either 80 96 or 132 char lines Double width chars is w selectable Full upper and lower case ASCII (96 char) printed in 7*7 matrix Data input may be either serial (RS232 or 20 mA current loop) or

MPI 88T bi directional printer from Impectron Ltd

parallel [illegible] with standard 2 line buffer [illegible] line set **SB MB**

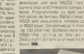
MEMC SYSTEMS LTD [illegible] SHEET AUTOMATIC FEED for SPI[illegible] a stack of ordinary letterhead [illegible] and prints each individually with out operator in attendance **SB MB (SPINWRITER)**

POWER EQUIPMENT COMPANY POW-QUIP PRESTIGE SILENCER for use with QUME R [illegible] printer Offer noise reduction of between [illegible] **MB (QUME)**



A [illegible] Spooler for the [illegible]

WEYFRINGE LTD CENTURY printer 96 column R[illegible] printer incorporating Burroughs PM107 series printer mechanisms and Z80 microprocessor Fully logic seeking bi directional and with RS232 V24 20 mA current loop and Centronics compatible interfaces Programmable for both vertical and horizontal tab formers Ballistic head 96 char ASCII with descenders Handles speeds up to 9600 baud Condensed print format allowing 132 char line Buffered store holds up to 3000 char of first in first out memory Des[illegible] pin or friction feed A4 [illegible] **MB**



[illegible]

FREELANCE WORK
SOFTWARE AND SYSTEMS
PROFESSIONALS
Please ring John Corner
or Shirley Parsons on
029 671 2049 or 4555
for details of present and
anticipated contract assignments
24 hour ansaphone service

VERSATEC [illegible] wide printer plotters [illegible] circuit technology [illegible] drivers allows a user to [illegible] VDU or other controller [illegible] self-diagnostics 22, 24, 36 and 12 plotters with resolutions from 100 to 200 dots per inch **BB**

Discs, Tapes, Punches, Readers

ACT

2.0 Mb PET [illegible] 8032 compatible DISK DRIVE offers 1.0 Mb [illegible] Double sided quadruple density [illegible] COMPU THINK INC [illegible] data transfer. DISKMON operating system and random [illegible] per track and [illegible] per side [illegible]

Megabyte PET compatible floppy disc [illegible]

ARBAT

TELECTRON [illegible] high speed paper tape [illegible] punch reader. Offered stand alone or [illegible] ARBAT's DEC based [illegible] systems. In [illegible] meets 3 requirements should [illegible] message [illegible] available to INTELEX II Message [illegible] any reason message can be processed [illegible] paper tape and re-routed via Telex [illegible] M62 can be configured to INTELEX [illegible] input device. M62 can be used to [illegible] Telex ready messages from an [illegible] banking system. Supplied complete [illegible] cable and interfaces. Has integral 1K buffer expandable to 4K by addition of 3K of [illegible] permitting baud rates of 50 to 9600 [illegible] either full or half duplex mode. Paper tape [illegible] can be processed. About £2500 **BB (Banking/Communication)**

DATA EFFICIENCY LTD

Market BASF magnetic media products

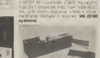
Data Efficiency Limited are now dealers for the [illegible] range of BASF high quality Magnetic Media

BRAND NEWs

[illegible] BASF [illegible] universally [illegible] including [illegible] DC [illegible] capacities from [illegible] conforming to ECMA ISO ANSI [illegible] and magnetic tape. **SB, MB BB**

BENCHMARK COMPUTER SYSTEMS LTD

CSSN BACKUP subsystem hardware software package [illegible] Offers [illegible] storage medium [illegible] 13.4 Mb mag tape cartridge making BACKUP ideal for use with high capacity Winchester discs. Comes with Z80A S100 compatible interface board, DEI cartridge tape drive, CP/M or DOS compatible software utility featuring [illegible] SAVE & RESTORE commands. £1895. Also [illegible] industry compatible mag tape systems for use with minicomputers where a micro-mainframe interface is required. **MB (S100 systems)**



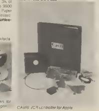
Benchmark CSSN back up subsystem

BFI ELECTRONICS LTD

VERBATIM ALIGNMENT DISCS. OPTIMA Series OS 1 and OS 2 diskettes are used for alignment of single and double sided 8" flexible disc drives. Type OS-5 is for 5¼" single and double sided mini disc drives. Each disc is provided with write-protected data. Makes Index use for photo detectors, Track 00 detector and head load timing. Track 38 location (8") and Track 16 (5¼") of recording heads and azimuth adjustment of the carriage alignments possible. **Engineers**

CAVRI SYSTEMS

VGR controller based on APPLE computer. Can be used to integrate computer assisted and video-aided instruction as well as to index and [illegible] frames or segments of video material. **MB (APPLE)**



CAVRI VCR controller for Apple

DATA GENERAL

Model 6096 dual sided/double density diskette subsystems for microNOVA computer family. Hold over 1.25 Mb of data per drive. 6098 controller is a single 7½ x 9½" board that mounts in one slot of microNOVA chassis. Two models: 6096A with one diskette drive, 6096B with two. Up to 3 drives can be configured using add on drive Model 6096C giving 3.78 Mb of on line storage. Comprehensive software support is provided by both MP/OS and DOS operating systems. Media has 77 tracks per side with 16 sectors of 512 bytes each per track. Data transfer is at 62500 bytes/sec; head positioning times 25 millisec track to track, 100 millisec random average and 253 millisec full stroke including seek settling time. Rotational latency at 360 rpm is 83.3 millisec. **MB (MicroNOVA)**

Dual sided double density diskette sub system for Data General's family of microNOVA computers

DATA TYPE SYSTEMS

T & E ENGINEERING INC's "ANOTHER DAM FLOPPY". Dual 5¼" drives using industry standard recording (FM, MFM, M²FM or GCR) giving 400K bytes of useable data, 10 sectors of 512 bytes double density format, 40 tracks. Track to track seek time 12ms, head load time 15ms, average random access time 270ms. Ceramic dual density straddle erase read write head. Clamping action locks diskettes into position. £340 per unit (OEM price) **SB MB OEM**

DICOLL

DE5100 mini floppy disc system. Incorporates LSI 11/2 central processor plus a dual height mini floppy controller capable of operating 4 drives each with a capacity of 360 Kb formatted. Track to track access time 6ms. Expansion space permits up to 32K words MOS RAM and a selection of I/O devices and ADCs. Can be supplied with RT11 V30B in either single job or foreground background mode, or UCSD Pascal, FORTRAN IV and BASIC are options. DE 5200 dual drive magnetic cartridge system incorporating DEC TU 58 cartridge drives with independent power supply each having formatted storage of 256 Kb. DE 515 magnetic tape subsystem believed to be first LSI 11 and PDP 11/03 23 and is designed to operate in conjunction with Pertec FT series of tape transports (or similar) to provide options for recording mode, data density, speed and reel size. Fully compatible under RT11 operating system and operates in DMA mode communicating with computer via own interface. Dicoll are also distributors for ADVANCED ELECTRONIC DESIGN's range of single and double density disc subsystems, cartridge disc subsystems and Winchester drives. **MB OEM**

HEWLETT-PACKARD

HP 9895A flexible disc drive. Double sided double density format storing up to 590 Kb per disc side for total of 1.18 Mb per disc. Designed for use with technical computers eg HP 1000 Series L, E and F, HP 85 personal computer and System 25, 35 and 45 desk top computers. Interfaced via HP IB

HP 9895A flexible disc memory

Interface bus. Built in controller allows 9895A to exchange data with other systems using IBM 3740 single sided single density format if additional s/w exists on host. Can provide up to 4.72 Mb of storage through optional dual drive slave unit without controller. Can also be ordered with one drive installed for 1.18 Mb capacity. Self test capabilities: hardware self test initiated and reported at power up. Read/write tests can be initiated manually or through HP IB. Dual drive with controller £3810 **MB, BB**

NASHUA

4420 removable disc cartridge for use on Control Data's cartridge module drive CMD 9448 series Phoenix. 16 Mb front insertable top loading 0.075 disc: one surface used to record data, other acts as dedicated servo. 348 tracks/inch, 6038 bits/inch at inside, 823 tracks per surface (807 primary, 15 alternate). Same cartridge can be used in Ampex DFR 9000 disc drives **BB, OEM** (Control of Data)

MEMOREX

"Industry's first" fixed/removable Winchester 201. Total capacity 25 Mb, 12.5 Mb fixed storage and 12.5 Mb removable storage. 2001 removable cartridge provides back up for 201 and allows 201 to act as back up for other devices (also provides user with write protect feature for protection of stored data). Carriage interlock mechanism gives positive opening and closing for environmentally sealed atmosphere. Access time 30 millisec. Seek errors estimated at 1 per 1 000 000 reads. Also available is the Memorex 101 8" Winchester disc drive (announced earlier in the year) with storage capacity of 11.7 Mb on 2 8" discs. Allows for expansion (Model 102 has 23.4 Mb capacity achieved by adding 2 more discs) up to 46.8 Mb. Environmentally sealed. Drive motors have been integrated with spindle in all Memorex 8" Winchester drives eliminating belts and part count **OEM**

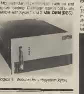
The computer industry's first fixed/removable 8" rigid disc drive — the Memorex 201

XYLOGICS

8" Winchester disc subsystem XYLOS for DEC users. Rack mountable modular system with capacity up to 40 Mb. Tape cartridge for back up and complete LSI 11 emulation. Features single card microprogrammed peripheral processors for emulation of DEC I/O handling protocols. LSI 11 can be expanded to 256 Mb of memory. 3 configurations: Xylos 1 with 1.24 Mb 8" Winchester drive, Xylos 2 with 2 drives and Xylos 3 with 2 drives and a

BRAND NEWs

1.7 Mb cartridge tape [illegible] back up and program loading. Cartridge tape is optionally available with Xylos 1 and 2 **MB, OEM (DEC)**



Xylogics 5" Winchester subsystem Xylos

Bureaux, Consultancies, Services, Shops

ALACRA

Two new computer form handling machines BOWE 305 GUILLOTINE and BOWE 405 DECOLLATOR. Intended for smaller user, priced at £2795 and £1795 respectively. 305 is sprocket driven and can cut printout into forms 4" to 12" deep. Noise is minimized and performance is between 2800 and 6650 forms per hour **MB**

BARIC

Is to put MARKET AND RESEARCH INTERNATIONAL (MORI) on Prestel giving up-to-date opinion and research findings to Prestel users on a regular basis. This will include voting intentions, political personality ratings, economic expectations etc. Baric is the most accessed Prestel information provider and the new info will be on channel 350029 **PU, SB, MB, BB (Prestel)**

CONTROL DATA

INQUIRE database management system with integrated information retrieval and full text processing facilities developed by INFODATA SYSTEMS INC and provided in the UK on CDCs CALL/PLUS SERVICE as part of its International Data Services Network. Network provides timesharing service for both business/management and scientific/technical problems. CALL and CALL/PLUS are supported by SEC (Service Bureau Company), a wholly owned CDC subsidiary **MB, BB**

CORPORATE BUSINESS SYSTEMS

BUSINESS MODELLING WORKSHOP to support the implementation of computer systems for senior management planning and decision making. Involves three stages: visit to CBS offices to set up model; 3 day on or off-site workshop to set up first stages of comprehensive senior management system using clients computer or CBS bureau and to develop a project plan (approx cost £450); programme of consultancy assistance to complete design and implementation of the system **Managers**

DATA 100

ORDERING SERVICE for consumables (diskettes, mag tape media, printer ribbons [illegible] users dial Harpenden 63161 ext 25 [illegible] (max) delivery **SB, MB, BB**

EUROSEC

FIRE RESISTANT COMPUTER TAPE PROTECTION FILES. One, two or three drawer models. Suitable for IBM, Univac or NCR storage requirements. Conform to international standards, hold UL class 150 fire label **SB, MB, BB**

GEISCO

HIGH PRO numerical control preparation system for punching, shearing and other sheet metal fabrication operations available on MARK III remote computing service. Developed by STRUCTURAL DYNAMICS RESEARCH CORPORATION. HI PRO substantially reduces programming and verification times and results in minimum scrap through proper pattern layout. Comprises four main programs: APPOINT for computer assisted parts programming, PAL for pattern layouts, PAM path minimizer for reducing tool travel and VERSIGRAPHICS visual verification and documentation at any point in the creation of the NC program through the use of a plotter linked to the MARK III Network **Engineers**

GOSHERON

TEAR PROOF COMPUTER LABEL SHEETS. Full range of 48 different sizes in zig zag packs laid one up, two up or three up on backing paper **SB, MB, BB**

LAWTONS LTD

Market CAVE TAB computer media storage and handling systems. Range includes free standing and table top decollators, compact mini table-top mini burster, two or three compartment media storage cabinets and Data Mite Safe, a purpose built fireproof media security cabinet **SB, MB, BB**

Linden Pride work station incorporating Kinnarps 68M Terminal Table

LINDEN-PRIDE

Market KINNARPS terminal tables. Range includes permanent RHM T and RHM B tables and new adjustable 68m table which allows height adjustment etc. Ar [illegible] include turntables and additional furniture [illegible] comprise full work station. **SB MB BB**

MOORE-PARAGON

MODULINE range of filing storage equipment. Includes printout binders, desk top storage units, lockable storage units, mobile and modular units, lateral filing systems and data storage cabinets. **SB MB BB**

RONCO SALES ORGANISATION

DISTRIBUTED MASS TURNTABLES. Two models, one for general office purposes and [illegible] the other for VDUs. Both models can be supplied with central hole for equipment lead and plug. Incorporates a new bearing principle so that entire rotating section surface is in effect covered by a bearing medium so that the turntable load is evenly spread and virtually untiltable. **SB MB BB**

RONEO VICKERS

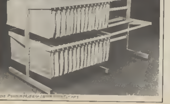
PORTABLE FILING AND STORAGE TRAYS. Manufactured in high impact polystyrene. 5 models suitable for index cards, business forms, cassettes, microfiche and punched cards in sizes ranging from DIN A7 to DIN A4. Supplied with 2 adjustable dividers. [illegible] and £4.3[illegible] £9.5[illegible] each. **SB MB BB**

SCICON

Five packages available from [illegible] Computer Services to help control costs of transport and distribution. TRUNK PLANNER developed by the National Physical Laboratory which is concerned with bulk goods movement such as factory to distribution depot. DEPSIT and SUITE to avoid high development costs for straightforward depot siting problems. BRS PATHFINDER solves secondary distribution problems such as fleet size and route planning [illegible] finding the best vehicle mix to deliver goods. SCICOPATH solves primary route planning problems by giving the best routes from various starting points to each destination. **Distributors**

TRIAD TECHNICAL AND INDUSTRIAL SERVICES LTD

A new consultancy offering a range of services to industry including technical research, industrial management and office services. Provided by a team of directors, advisors and consultants. Also offers help to UK companies expanding overseas or foreign



Moore Paragon Hudson [illegible] Systems

BRAND NEWs

[illegible] technical areas [illegible] industrial electronics [illegible] medical electronics [illegible] microprocessor electronics and chip design & circuits. **SB, MB, BB**

UNILEVER COMPUTER SERVICES LTD

(UCSL) now offers database processing and communications service using the ADABAS database management system. Developed by Software AG, ADABAS can handle relational network and hierarchical structures with full logging and recovery as well as batch and on-line data entry and retrieval facilities. UCSL will offer the system to organisations like trade associations and insurance companies whose business produces large amounts of administrative data. **BB**

Exhibitions, Courses, Events

ALAN PEARMAN LTD

Series of seminars *APL on a Micro* featuring demonstrations, existing APL software and HANDS ON practice. £25 per delegate. **SB, MB (APL)**

ANSA

Computer manufacturers 30 minute video *The Ultimate ANSA* explains how microprocessors work and how they can help companies. In conjunction with RADIO RENTALS chain, ANSA will deliver a video recorder, colour portable tv and copy of the film to a person's home for three days for £25. **SB, MB**

BEYTS LOGIC LTD

2 or 3 day course seminars for small groups of people. Informal, suitable for novices and tailored to the requirements of the people attending them. Held in London, Sunbury or at customers premises. £60 per person per day. **SB MB**

BIZTRONIC EXHIBITIONS

Forthcoming exhibitions of [illegible]

SMALL TURNKEY SYSTEMS

Complete systems to your requirements from one source
Specialists in Financial and Commercial applications

CROMEMCO/CENTRONICS/CIFER systems
Financial Planning ■ Budgeting and Reporting
Schedule Order Handling ■ Invoicing
Sales/Purchase/Nominal Ledgers
Stock Recording
Name and Address Processing
Information Index
Word Processing (Wordmaster etc.)

TANDY/CENTRONICS systems
Builders (House) Commercial System

All in BASIC — source available
Expandable to
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We aim to solve YOUR problems
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IBM GOLFBALL PRINTERS
From £425.00 + VAT

Reconditioned printers with keyboard and RS232 interface

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BRAND NEWs

microcomputers word processing equipment copiers and other electronic office equipment *Oct 1 2* Hotel Leofric Coventry Oct 21 22 Forum Centre Withenshawe Manchester *Nov 18-20* Prestonfield House Hotel Edinburgh *Dec 2 3* Novotel Long Eaton Derby Organised by Groundrule **SB MB, BB**

BRITISH COMPUTER SOCIETY

2 day conference *Minis Micros and Terminals* organised in conjunction with the Institute of Information Scientists £65 for IIS and BCS members £90 for non members NCC Manchester *6-7 Nov* Also 1-day conference *The Impact of ADA* sponsored by The Computer Journal £60 for BCS members (£25 student members) £80 for non members Royal Institute of British Architects London *21 Nov* **MB, BB**

BRITISH INSTITUTE OF MANAGEMENT

2 day intensive course *Getting to Grips with Mini and Micro Computers* incorporating "hands on" experience *Oct 7 8* Manchester Business School *Nov 12-13* Berners Hotel London *Jan 19-20* and *Feb 19-20 1981* Management House Also 2nd USA Study Tour *Microprocessors in Action* 5 day intensive study tour of computer manufacturers and users on East Coast of USA In addition *Japan Robots* Tokyo Kyoto Osaka *10-25 Oct 1980* **Managers**

HEWLETT-PACKARD

Two seminars to be held in the autumn *17 Sept* and *30 Oct* — of interest to computer managers and all those concerned with the maintenance of reliable data communication links covering basic data transmission techniques and how these are implemented by PPTs the testing [illegible] and the test equipment required Free **Computer Managers/Data Transmission Specialists.**

INTERNATIONAL CORPORATE FINANCE CONFERENCE

Presented by SEMINARS INTERNATIONAL at the Café Royal Regent St London *October 29 30 31 1980* Features 30 seminars and workshops — multichoice as 3 held simultaneously given by distinguished guest speakers **Financial**

KEY HOLDINGS LTD

Four keyboard operator training companies have co ordinated resources under the board of this company to offer the world's most comprehensive training in this field from data processing personnel and office typists to printers Live and audio visual training is offered in 20 countries **Keyboard Operators**

LONDON CHAMBER OF COMMERCE AND INDUSTRY

Computer Training Courses for 1980/81 *Introduction to Computers and their Applications* 1 day *24 Sept 22 Oct 3 Dec 1980 4 Feb 30 May 24 June 1981* *Cost effective Use of Microcomputers in the Business Environment* 1 day *8 Nov 1980 18 Feb 1 May 8 July 1981* *Introduction to Microcomputer Programming* 2-days *12 13 Nov 1980 18 19 March 15 16 July 1981* All courses are held at Polytechnic of the South Bank Department of Electrical and Electronic Engineering and are timed from 0930 hours [illegible] hours 1 day courses cost £60 to LCCI members £80 to non members 2 day courses cost £110 to members £150 to non members (exclusive of VAT) Morning coffee lunch and afternoon tea are provided as well as course material **SB, MB BB, Managers Programmers**

MAILING EFFICIENCY EXHIBITION

Organised by the Business Equipment Trade Association at the Cunard Hotel London *October 4 17 1980*

MIDWICH COMPUTER COMPANY LTD

In conjunction with the UNIVERSITY OF EAST ANGLIA at Norwich series of 5 day basic introductory courses at the university to introduce the microprocessor to people already in industry whose knowledge of new technology is scanty or non existant Courses have received support from Dept of Industry (DoI) through the MAP scheme Accent is on practical work and specialised equipment includes Z80 based Nanocomputer **MB BB**

MSS COMPUTER & BUSINESS CONSULTANCY LTD

Courses to be held in Worthing during October and November *OCTOBER Computer Appreciation for Managers & Users 8 9 Principles of O&M 8 11 Advanced RPG II Programming 10-12 Accounting for Non Accountants 15 16 O&M in a Computer Environment 22 26 Production Planning & Control 23-26 Finance for Managers 29 30 NOVEMBER Computer Operations Management and Control 3 5* **SB MB, BB**

▶ *Addresses on page 86*

XITAN SYSTEMS LTD

The South's CROMEMCO experts

Need a Hard Disk System with FAST RELIABLE Backup?

Xitan now have the answer with the Z-2H plus DC300 Tape cartridge BACKUP system ($100 controller drive psu & software)

The Cartridge BACKUP system is available seperately for existing Z-2H users (13 4 Megabyte capacity — 1 Megabyte per 5 minutes)

Utilities/Software for CROMEMCO Systems

Tired of XFER — use FCOPY or DFCOPY Single sided 8 copy in 54 seconds Double sided 8 copy in 104 seconds £50 00 each

Need to build Assembler libraries — try LIBR at £50 00

CP/M 2.2 and MP/M 1 1 available for System 3 and Z 2H systems

EASYFORM For creation/Editing of forms on the 3102 VDU with structured Basic Forms useable from Cobol, Basic Fortran etc £160 00

BUSINESS SOFTWARE

CROMEMCO systems a complete Business system based on the system 3 from CAP-CPP Phone for an appointment to see it running

For the smaller customer, we have an integrated Sales Purchase and Nominal system for the North Star Horizon Nothing fancy but installed and running for over 7 months IT WORKS!

WHATIF! Cash Flow Accounts budgetting utility Just released Incredible value at £95 00

Also available an Incomplete Records system for the Horizon

SPECIALS

Real Time Clock — S100 — 100 microseconds up to 99 999 days £185 00 Hi Tech S100 PAL colour card 24 x 40 Prestel format £295 00 Video Vector Fastlib £495 00

Dual Tandon Double/sided 40 track minifloppy subsystem £625 00

INTEGRATED SPECIALIST SYSTEMS

MEDIDATA 32,000 patient Doctors system Installed and running Prices from £7 500 00

RETURNED ALE Run a brewery? Keep track of returned ale and reclaim Excise Duty Track down production and storage problems Copes with 10 000+ barrels Prices from £8,500 00

Xitan Systems also supplies and stocks vdus printers NORTH STAR HORIZON computers Commodore Business Machines PETs S100 boards and books We are here to demonstrate the range of quality microcomputer systems available for use today Ring up for an appointment now! You'll not be disappointed We have Osborne's Sales Ledger and Payable Ledger in source form for use on Cromemco System 3 with CBASIC2 and we can offer a customising service on these programs Additional software includes Microsoft Basic Interpreter and Compilers Cbasic Macro80 and CP/M for the North Star Horizon

XITAN SYSTEMS LIMITED
23 Cumberland Place Southampton SO1 2BB
Telephone (0703) 38740 *Hours Tuesday_Saturday 9 30am to 5 30pm*

▶from page 48

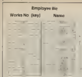

Employee file
Works No (key)
Name

Figure 3

trieval is still very efficient

As an example consider the search for the record with the key 75 The caculation used previously gives the address as record 16 There is another record there already so look at record 17 but since this belongs to the record with key 876 look at record 18 – and that is the record required

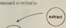
Normally, we terminate the search for a record when either the record we want is encountered or an empty record is encountered When an empty record is found this means that the record that we are looking for is *not* in the file The algorithm for the search can now be expressed a little more formally as

```
take the key and calculate the initial position
while the key hasn't been found or an empty record encountered do
    move to the next position in the file
```

Computed addressing methods start to become inefficient when the entries start to bunch up together and long sequential searches take place This can be counteracted by choosing a better rule for calculation and a better collision resolution method The main reason for presenting two fairly inefficient rules in this article is the fact that they are both very simple to explain

A particularly good calculation method which can be used when your file size is a power of two involves taking a series of binary digits from the middle of the key

For example assume that the file size is 32 ($=2^5$) The calculation would take 5 binary digits [illegible] the middle of the key and use that as the [illegible] position in the file Thus if the key [illegible] was used then this is expressed in [illegible]



The appropriate middle five digits would give an initial position of $10001_2 = 17$ This method tends to give a fairly even spread of entries in the file without any bunching up

Even with a good calculation method, long sequential searches occur when the file starts to fill up and contains few unoccupied entries In general the performance starts to degenerate after the file becomes 50% full In this case the best solution is to •unload all the entries from the file •create a new file larger in size than the old file (I generally double the size) and then •insert the entries into the new file

To take an example in the file of 20 records that I previously considered the search time will increase considerably after 10 records have been inserted. The strategy is then to unload these records, create a new file containing 40 records and use the rule

'take the key find the remainder upon dividing by 40 and add 1'

to re insert the records into this new larger file

The majority of operations involved when a file is organised for computed addressing are simple The only operation that does pose problems is deletion Consider the diagram **Figure 4,** where 12 records have been inserted into the 20 record employee file Assume that the employee Cranby has left the enterprise His position (7) is now vacant Now assume that a request for the record corresponding to key number 43 is made You will notice that the key 43 is in the table but has been placed at position 9 after a number of collisions When the record is retrieved its initial position is calculated as being the remainder upon dividing 43 by 20, + 1, = 4 The search continues from position 4 until the key 43 is found or an empty position is found Unfortunately, the empty position corresponding to the deletion of Cranby (7) is encountered *before* the record with the key of 43 is encountered The algorithm is forced to conclude that the record with key 43 has *not* been entered in the table

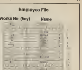

Employee File
Works No (key)
Name

Figure 4

The solution to this problem is to keep a deleted record in the file and somehow *mark* it as being deleted An easy way to do this is to include an extra field to contain a zero for an active record and one for a deleted record The employee file record will now contain the following fields

works no	name	deleted

We can now apply the previously explained algorithm for searching The marked deleted records can be erased when the records are unloaded, prior to being rehashed when the table becomes crowded

To sum up, you have seen how computed addressing enables a rapid response to be maintained However this rapid response is achieved at the cost of keeping a large part of the file empty ■

•Dr Darrel Ince is at the Faculty of Mathematics The Open University Milton Keynes

'THE MICRO REVOLUTION' ('Change for the Better or for the Worse") by Peter Laurie (Futura Paperback £1 50)

This book is not about microcomputers In fact microprocessors are only referenced once in the index Its scope is very much broader

The author, Peter Laurie is an investigative journalist whose own unique brand of saturation sleuthing has won him something approaching cult status To research this book he adopted the role of Editor of Practical Computing magazine From that vantage point he has conducted a thorough-going inspection of the new technology

It is a measure of the speed at which that technology is developing that in the eighteen months since pen was first set to paper some of the examples given should have acquired a rather dated air

The author's last book was 'Electronics Explained' and there is quite a lot of that here too – and rather better explained than I have seen previously The chapter headings give an idea of the book's scope if not its flavour 'The Computer' 'Data' 'Internals' 'Chips', 'Memory Devices' and so on The real meat is to be found in these explanations which are enlivened with such remarks as "The Third Reich was perhaps the nearest thing we have seen to a fully developed multi national corporation" In other words – THIS BOOK IS FUN It is also probably the best work on the subject to date Hurry up and buy it before it is out of date

Julian Allason

EDITOR'S CHOICE

The Personal Computer Book by **Robin Bradbeer** *pub* **Input Two Nine** (£5.25; 220pp). This book is about as basic an introduction as a layman could get Anything more basic would be vapid Robin Bradbeer has done a good job within the limits he has set himself The book is worth its cover price ■

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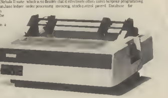

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Data Base Management Systems **Clyde Holsapple**

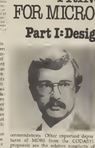
PRINCIPLES FOR MICROCOMPUTERS

Part I: Designing a schema

[illegible]

Over the last decade data base principles and techniques have been widely applied on large-scale computers Numerous vendors currently offer generalized data base management (DBM) software for handling information processing problems on large scale computers With the advent of Micro Data Base System s generalized DBM software data base principles and techniques are for the first time available for application on micro-computers The features available to a micro-computer user through the MDBS software resemble (and in some ways surpass) the features available through DBM software that has been developed for large-scale computers

It must be emphasized that we are not using the term data base in the loose popular sense We are not simply referring to a collection of data nor to a file, nor to a collection of files We shall use data base in its strict sense (as outlined by the CODASYL Data Base Task Group Report*) In view of the novelty of a generalized micro-computer data base system, this data base primer is presented as an educational service of Micro Data Base Systems Inc The objective of this primer is to leave the reader with an appreciation of data base management in the strict sense particularly in a micro-computer environment. The primer offers a concise yet substantial and practical overview of the principles and techniques of a data base management as provided by MDBS software For full details consult the MDBS User s Manuals



The MDBS approach to data base management stems from the recommendations of the CODASYL Data Base Task Group Report of 1971 * In this respect it resembles a number of the most prominent and well-received DBM software packages currently in use on large scale computers Like them, it supports network data structures built from the CODASYL construct called a 'set' and it furnishes the user with a data manipulation language (DML) that can be used within a host language Furthermore incorporated within the MDBS package are several features (e g the N M set) that extend beyond the CODASYL recommendations Other important departures of MDBS from the CODASYL proposals are the relative simplicity of MDBS DML syntax and the use of host languages other than COBOL

Designing a Schema

A *schema* is the *logical structure* according to which data in the data base will be organized

A **The three** *building blocks* **used in designing a schema**

1 *Data ITEM types* are the smallest units of named data

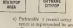
- a) Examples NAME, AGE these are *types* of *data*
- b) *You decide* how to refer to a particular data item type, you may use up to eight characters For example you might decide to refer to the data item type for *state name* as *STATENAM* You might decide to refer to *state population* as *STATEPOP*
- c) A *particular instance* of a data item type is called a data item *occurrence* or a data value For example Indiana is an occurrence of *STATENAM* Ohio' is another occurrence of *STATENAM* etc 5 123,497 is an occurrence of *STATEPOP*

Micro Data Base Systems' complete range of products is available through their UK distributors Systems Plus Ltd Implementations currently available are Z-80, 8080 8085 6502 6086 and Z-8000, with a choice of host languages Basic, Cobol, Fortran, Pascal and machine language Soon to be available are multi user versions initially under the MP/M and FAMOS operating systems

Systems Plus are at Glengormley Park, Newtownabbey, BT36 7RE, Tel 02313 42117

2 A named aggregate of data item types is a *RECORD type*

- a) Example CITY, composed of the data item types *CITYNAME* and *CITYPOP*, is a *type of record*
- b) *You decide* how to refer to a particular record type, you may use up to eight characters For example, you might decide to refer a record type for *state* as *STATE* You also decide which data item types should be aggregated to form a record type, you might decide that *STATE* should be composed of STATENAM STATEPOP and AREA
- c) A *particular instance* of a record type is called a *record occurrence* or, simply, a record For example the three data values (Indiana 5 123 479 and 26,523) form a record occurrence of STATE Here INDIANA' is the STATENAM data value 5,123,479 is the STATEPOP value and 26 523 is the AREA value An occurrence of the record type CITY is ('Lafayette 62,000) Lafayette' is the CITYNAME datum and 62 000 the CITY POP value
- d) Pictorially a record type is represented by a rectangle enclosing its data item types The STATE and CITY record types are drawn as follows



- e) Pictorially a record occurrence is represented by an ellipse or circle enclosing its data item values

is an occurrence of STATE

---

*The Data Base Task Group was composed of representatives from hardware and software manufacturers governmental and industrial users and university researchers The recommendations in their report were proposed as standards to be used in the design of generalized DBM systems

3. A *SET* is a named relationship between (typically)* two record types, one of which is called the set's *owner* and the other is called the *member* record type. According to CODASYL conventions a set can be declared between two record types *only if no occurrence of the member record type is associated with more than one occurrence of the owning record type.* This restriction is termed a one-to-many or 1-N relationship. There is no restriction on the number of member occurrences that can be associated with a given occurrence of the owning record type.

Micro Data Base System's MDBS is not limited to the CODASYL convention of a set. MDBS also permits many-to-many relationships to be directly represented by N:M sets. An *N:M SET* is a named relationship between two record types, one of which is *arbitrarily* called the owner and the other is

DBMS

called the member. An N:M set differs from a conventional set in that *each occurrence of the member record type can be associated with many occurrences of the owner record type.* As with the conventional set, an owner occurrence can be associated with numerous member occurrences.

a) *Example of a Set.* To express the fact that a state has cities, define the set HAS with STATE as the owner and CITY as the member. Notice that no occurrence of the member record type CITY is associated with (i.e. is had by) more than one occurrence of STATE. However there may be many (N) occurrences of CITY associated with a particular occurrence of STATE. So a state *has* many cities but a city is in no more than one state.

   Example of an N:M Set. To express the fact that a company can be located in *many* cities and a city can have *many* companies located in it, define the N:M set LOCATION with CITY *arbitrarily* declared as the owner and *company* as the member. Notice that an occurrence of COMPANY can be associated with many (N) occurrences of CITY and an occurrence of CITY can be associated with many (M) occurrences of COMPANY.

b) *You decide* how to refer to a particular set or N:M set; you may use up to eight characters.

c) A *set (or N:M set) occurrence* consists of an occurrence of the owner record type plus all occurrences of the member record type that are owned by that owner occurrence. The occurrence of STATE for Indiana plus all CITY occurrences for cities in Indiana form a set occurrence of the set HAS.

d) Pictorially, a set (or N:M set) is denoted by an arrow that points from the owner record type to the member record type. The set HAS and the N:M set LOCATION are drawn as follows (Figure 1).

e) Pictorially, the fact that an occurrence of the member record type is associated with some occurrence of the owner record type is represented by an arrow pointing from the owner occurrence to the member occurrence. Thus an example of two set occurrences of HAS is drawn as

---

*See the MDBS User's Manual for an explanation of sets that have multiple member record types, multiple owner record types, the same record type as both owner and member. The latter two features go beyond the CODASYL proposals.

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follows (assuming that information is held for only three cities in Indiana and two in Illinois) (Figure 2)

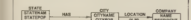


Fig 1

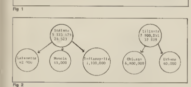


Fig 2

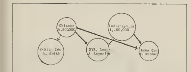


Fig 3

From this picture it is clear why it is often said that a set specifies a *1 to many* or a *1 to N relationship* for one owner occurrence there can be many (N) member occurrences but for one member occurrence there is at most one (1) owner occurrence No two occurrences of a set have any record occurrence in common

Two occurrences of an N M set may have shared record occurrences For instance the following two N M set occurrences of LOCATION have two record occurrences (XYZ, Inc and Acme Co) in common (Figure 3)

f) To reiterate an N to M or many to-many relationships between two record types means that we would like to associate many occurrences of the first record type with one occurrence of the second record type and conversely we would like to associate many occurrences of the second record type with one occurrence of the first For example if RIVER is a record type then there is an N to M relationship between RIVER and STATE A river can flow through many (N≥0) states but a state can contain many (M≥0) rivers

We have seen that in the MDBS an N-to-M relationship can be represented by an N M set. It can also be represented by two sets and a third record type as follows (Figure 4)

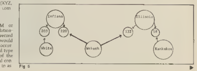


Fig 5

This is the traditional CODASYL method for handling N to M relationships If the intervening record type Z has no data item types this method for handling N-to-M relationships is inferior to the simple use of an N M set between STATE and RIVER It is less efficient storage wise and makes programming cumbersome However it is sometimes desirable to have data items types in the intervening record type For instance Z might contain RLENS river length in state An example occurrence structure for this is (Figure 5)

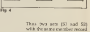


Fig 4

Thus two sets (S1 and S2) with the same member record type can be used to incorporate an N to-M relationship into the schema Notice that each occurrence of the intervening record type Z is associated with one river and one state giving a river state pair (Wabash has a length of 220 in Indiana and 132 in Illinois)

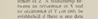
g) In addition to the N:M set feature of MDBS, there are several other advanced data structuring features that MDBS supports Consult the MDBS manual for descriptions of sets with more than one owner record type with more than one member record type and with the same record type as both owner and member These features allow for great flexibility and efficiency in designing data structures

4 A diagram of data item types, record types and sets is called a data base schema A diagram of specific data values record occurrences set occurrences, etc is called an occurrence structure

▶

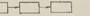
B Varieties of Schemas
With the data item type, record type and N:M set building blocks you can construct an unlimited number of different schemas. But whatever schema you construct it will be one of the following categories:

1 *Disjoint record types.* This variety of schema consists of record types without any sets or N:M sets. For example (data item types are now shown):

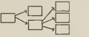


Three files are implied by this schema: one consisting of occurrences of record type X, one composed of occurrences of Y and one composed of occurrences of Z. A relationship between an occurrence of X and an occurrence of Y can only be established if there is one data item type that appears redundantly as part of X and also as part of Y. Since this variety of schema has the same limitations as a file management system, we shall consider it no further. In effect, this kind of schema forces us to use the data base management system as if it were merely a file management system, i.e., sorting and merging files.

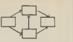
2 *Linear structures.* This variety of schema allows only a pattern of sets and record types in which no record type is the owner of more than one set and no record type is the member of more than one set. There are no N:M sets. For example:



3 *Tree (hierarchical) structures.* Here the only restrictions are that a record type may not be the member of more than one set and that there are no N:M sets. For example:



4 *Network Structures.* In schemas of this variety there is no restriction on the number of sets that a record type can own or be a member of; for example:



If a schema contains an N:M set it is a network structure.

As is easily seen, a network based DBMS can support disjoint record types, linear structures and hierarchical structures as special cases. Similarly, hierarchically based DBM software (e.g., the HDBS described in Part III of the primer) can support disjoint record types and linear structures as special cases.

C A procedure for Designing Your Own Schema
How can you translate your own detailed knowledge about an application area into a correct schema? This is the first phase of setting up a data base management system. We recommend that you use the following simple 7-step procedure for schema design. After presenting this procedure we shall walk through an example to illustrate how the procedure works. ■

●*Next issue: The 7-step procedure for schema design*

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TESTROLOGIC

Testing, storing and retrieving of logic

This new aid to decision making was first presented to the public by The Financial Times *and the NRDC. This article is its first presentation in a popular magazine*

Testrolog is an acronym for "testing, storing and retrieving of logic". But it is best to think of the concept we are going to talk about as Testrologic which is a general theory of logic of decision tables and decision making. We can then look briefly at particular Testrologs which are implementations of the theory and I shall concentrate on the programming of the Testrologs where the versions of the Testrolog involved are the series called **Explorer**. The whole ingenious idea and its development is that of Mr Stavros Foundos, a qualified accountant with a special interest in logic and computers who has spent many years developing the ideas involved, and has received aid from both NRDC (National Research and Development Council) and the *Financial Times*, who recently gave a presentation on the subject.

Within the context of the complex field of decision-making and planning activities, which take a large variety of forms, we meet a technique which has long been established in the computer world, ie decision tables. Our discussion of Testrolog can best start with them.

DECISION TABLES

The basic idea of a decision table is that all branches of the decision tree respond to questions answered by "yes" (Y) or "no" (N). Let me look at a table which deals with four questions and therefore has 2^4 (16) possible answers.

Here is the decision table

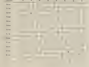


Figure 1

(How a decision table works. In the figure above there are four **questions**, each of which can be answered Yes (Y) or No (N). So there are sixteen possible outcomes of replies for each set of four questions. Each possible outcome of replies will prompt an **action** in response to it. For instance, look at the third column. This combination of Yes and No replies to the four questions Q1, Q2, Q3, Q4 is NNYN. This will prompt the action (X) in the third row and third column — **Editor**)

In flow charting terms this decision table would look like

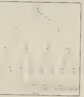


Figure 2

where each diamond represents a question (Q1 – Q4).

There are now two characteristics which can be seen very clearly here. One is that the growth of such nets is exponential where 4 questions lead to 2^4 (16) outcomes, and the rapid growth is hard to contain. Against this is the other characteristic which is that all the outcomes or actions *may not be different*. Given 1,024 possible actions, the decision table may in fact only say 4 different actions. It is at this point that Testrolog begins to be so important and I will now describe its role.

Question 1	N	N	Y	Y
Question 2	N	Y	N	Y
Action 1			X	
Action 2				X
Action 3	X	X		

Figure 3

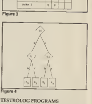


Figure 4

TESTROLOG PROGRAMS

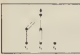
First of all we shall carry on from the above example, and although colour is used in the *Explorer* series, we shall here (to avoid the need for colour) follow a technique which was designed by Mr E A Newman, and in the case of colour distinc tions, we shall instead use single lines (yes) double lines (no) and a series of x s for Y and N (ie it does not matter how you answer the question) Let us look first at a very simple example

See previous page

This has flow chart.

See previous page

and can be redrawn as a Testrolog program with ‖ for no, | for yes and ⁞ for either Y or N, and we do not care which



So now we look at how the Testrolog program appears in the *Explorer* versions of the Testrolog

EXPLORER

There are two or three versions of *Explorer* but their difference is only in size (the number of questions they can handle in any one program) The *Explorer 1* can handle some 10 questions and is a pocket version The next version handles 40 and is no longer a pocket version, another version can be used as an overhead projector and so on

The principles of the *Explorer* are identical with those outlined but the discrimination now makes use of colour rather than the three types of line ‖ | and ⁞ and are replaced say, by green, red and black lines

The green and red part of the colour code is arbitrary and could just as easily be blue and orange, or red and green The program is drawn exactly as in Figure 5 with lines in colour and it is inserted into *Explorer* which contains colour filtre strips as shown in Figure 6

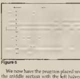


Figure 6

We now have the program placed under the middle section with the left halves of the filters over the program all in red The other half of each filter is green and in the right section

In this starting stage the green and black lines show up but not the red (the filter being identical in colour obliterates it) If the answers to all your questions were 'yes", then you move none of the filters If they were all "no ' you would move all the filters to the left and then the green and black lines would show up and the red would be obscured In practice we would expect some of the answers to yield Y and some N, so we get the dark line comprised of red on green green on red and black which look the same under either filter colour This means that for any position of the filters there is one and only one route (looking black) which runs from start to finish This route varies according to how the questions are answered

So, for example if we take the following Testrolog program in black and white format and redraw it in colour (Figure 7) only one route at a time would show up under the different filters for different states of the filter position The total number of routes is 32 (= 2^5)

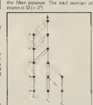


Figure 7

Now we pull across the red strip (answering No to Q1) and we have revealed (we shall now draw all lines *appearing* black as a thick black line regardless of whether they are black red or green on the original) the route in Figure 8

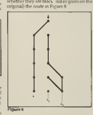


Figure 8

So only the continuous line leads to x_1

If we now show you the questions the reason for this is obvious The program is a very simple demonstration one and considers whether husband and wife should elect to be taxed separately or not Q1 is "are you married?", so if you answer "No" you are led inevitably to x_1 (= election inapplicable) The other questions are

Q2 Is your wife living with you?

Q3 Has your wife any taxable earned income?

Q4 Has your wife any taxable unearned income?

Q5 Have you any taxable income?

and x_2 = election inadvisable and x_3 = election to be considered So if we left Q1 answered as "Yes" (rather than "No") and then answered Q5 as No ' and after that both Q4 and Q5 as No ' we get the following two routes in Figure 9

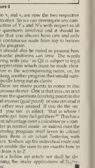


Figure 9

So x_3 and x_1 are now the two respective outcomes So we can investigate any combination of Y s and N's with respect to all the questions involved and it should be clear that you always have one and only one continuous route from top to bottom of the program

It should also be noted in passing how semantic problems can arise The words living with you ' in Q2 is subject to legal interpretation which must be made clear either in the accompanying notes, or, by making another program that would automatically bring out its clarity

There are many points to notice in this ingenious device One is that you can read it from the questions (starting point) to the final answer (goal point) or you can read it the other way around If you do the second you say in effect 'that is where I want to get how do I get there?" This has a great advantage over a calculator or a computer in normal mode or indeed over the Testrolog program itself (even in colour) unless there is an actual Testrolog with filtres to show up the individual route and thus enable the user to see exactly how to get from A to Z

In a follow up article we shall be discussing the many applications of Testrologic ■

●*Professor Frank George is the Head of Department of Cybernetics Brunel University Uxbridge Middlesex*

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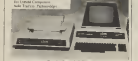

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David Munns

EXECUTIVE SEARCH

The [illegible] rapid expansion of the computer [illegible] both through natural growth and acquisition has [illegible] an unparalleled requirement for both middle and top management of the right calibre.

But within this fast changing industry how does the calibre of management stand up? How mobile are executives, where do they come from, what sort of salary scales are they on and, perhaps more important, how are they recruited? In order to answer these questions and more, David Munns, who is Managing Director of Korn/Ferry International, the management consultancy specialising in executive search, gives his views.

Korn/Ferry International is the world's largest executive search firm with 700 consultants and 73 offices world wide.

In order to keep up the demand for executive mobility within the computer industry they have recently formed a London based high technology unit whose specific aim is to advise on the placement of middle and top managers in the industry.

In this article David Munns outlines the various forms of recruitment available and in explaining how the executive search recruitment method actually works, he uncovers popular misconceptions and explains why computer firms are utilising this method much more.

A complementary article appears in the third [illegible] [illegible] magazine Business Computing.

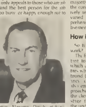
The increasing use of executive search over the more traditional methods of recruitment within the computer industry is within itself a reflection of the changing face of the computer world.

As the experience and expertise of personnel become less easy to define simply so the techniques of recruiting them have to become more sophisticated.

Executive search can be best explained by comparing it to the other available methods, namely • the "village" system • advertising recruitment and • contingency agencies. Whilst the advertising system will continue to be highly successful in recruiting personnel where there is an identifiable need – such as programmers or systems analysts – for positions higher up the scale where the job definition is not straightforward, executive search is undoubtedly the most efficient recruitment vehicle.

Each method has specific characteristics. The "village" system, for example, has the advantage of speed. A quick phone call, an expensive lunch (the only cost involved), a somewhat lengthy negotiation and – if salary, status and job satisfaction are right – you have brought in your man or woman. Knowing of someone "in the factory down the road" or hearing of them "on the golf course" as OK but the only thing lacking is objectivity. The nagging doubt that remains is whether or not the person is actually *the best one for the job*.

Advertising recruitment is a stage beyond that system. It is lengthier, more costly – but more effective. The advantage is that the net is thrown wider. Almost everybody in the computing world who is job hunting will read the advertisements but although invaluable in many areas this implicitly only appeals to those who are *job hunting* and the best person for the job may be too busy, or happy enough *not* to read the ads. This is true at the most senior levels but not necessarily at the middle management level. The cost of advertising recruitment can be 20% of the individual's first year salary, plus the cost of the actual advertisement.



David Munns, Managing Director of Korn/Ferry International

The second method, frequently referred to as the "contingency" agency, is so called because payment is contingent upon placement. There are well established and reputable companies in this field who retain files on individuals who have approached them because they wish to change jobs. From the individual's point of view this approach is less time consuming than responding to each and every recruitment advertisement. The agency often works on the basis of receiving fees only on placement, and these can be as low as 10%. The problem with this technique, however, is that it basically comes out of the filing system and is therefore not necessarily providing the client with the best person for the job. There appears to be too much reliance on individuals already known, which makes this approach only a more careful and extensive version of the "village" system. Nevertheless, for certain types of jobs the effectiveness of this method should not be underestimated.

So what about executive search? It certainly has something in common with all the above approaches, but is also an extension of them all. Whilst we too have files on individuals known to us, it is a total misconception that the executive search consultant is a "poacher" or a "flesh peddler". In reality, the professional executive search firm will rely mainly upon the skills of his extensive research department to identify likely candidates rather than rely on possibly outdated files.

The executive search consultant has a commitment which is open-ended to find the best person *available*, but not necessarily *visible*. He often supplies what the client *needs* rather than what he thinks he *wants*.

It should be remembered that in the majority of cases the personnel placed by the consultant are those who are not actively seeking jobs, their experience is so varied and the job specification so comprehensive that in no way could an advertisement attract them.

How it works

So how does executive search actually work?

The first step is for the client and consultant to jointly draw up a specification which defines the actual job and the sectors where the person is most likely to be found (manufacturing industry, consultancy, competitive company) which will also embrace those sectors *not* to be approached, as well as likely candidates that the client often wants to suggest. At this stage the consultant will be able to assess the underlying "feel" of the company, the total environment, and the actual position available.

This specification then goes to the research department, when a search plan is drawn up. The research staff then ascertains through telephone, written or direct research the names of executives in relevant organisations with responsibilities matching those of the vacant position.

These executives are then approached confidentially by the research department in conjunction with the consultant on the basis of seeking an individual's advice. The objective is to contact every executive whose own background and knowledge will lead to potential candidates.

This frequently extensive research – up to 100 companies are approached on every assignment – results in the names of brief career details of a number of men and women who are both interested in the position and suitable for it. Only a small percentage come from the confidential files which contain career details of previ ous candidates in the computer industry.

After discussion with all those executives who have expressed interest the consultant draws up a short list of those most suitable for presentation to the client in the form of a confidential written report. This embraces the executive's personal and educational background, a detailed summary of career experience – but most relevant of all, an analysis and appraisal of the individual in the form of an "overview" of the person in relation to the specification.

The final stage takes place when the employer meets the candidates of his choice, and all points being equal, an offer of employment follows. The consultant continues through the search considering it active until a placement is made and the new executive has joined the client's firm. It is a stated principle that should an executive have to be replaced within 6 months of employment for whatever reason (unsuitability, incapacitating illness or accident) this will be undertaken free of charge. The guarantee applies only to executive search, and in 10 years of Korn/Ferry International's operation this has never arisen.

In the computer industry there must be those personnel who are temporarily walking along the pavement rather than speeding up the high street. The consultant's job is to hand over the driving seat to those pedestrians who are facing drivers in disguise.

Top Management

In order to be successful in executive search, combining the advantages of having a specialist [illegible] is the key, with an understanding of the wider issues relating to business and management. Korn/Ferry International has a particular understanding of the computer industry, and the general management trends thereof as befits a management consultancy. A recent analysis of assignments by position, put Managing Directors top (25.64%) followed by Sales Executives (14.31%), Administrative Executives (11.64%) and Marketing Executives (12.03%). Salary levels average £22 000 per annum in the UK.

Individual salaries however in the electronics field are generally higher than in other industries. The Managing Director of a medium-sized industrial engineering company might not be earning more than £15 000 – £17 000 per annum, but his counterpart in the computer world could be grossing between £25 000 – £30 000.

There is also a strong American representation in the industry world-wide and indeed many assignments undertaken by KFI are searched internationally.

The British executive tends to stand up well within the scenario because of an educational system which teaches people "to think" and because British executives tend to be much more adaptable than expatriates of any other nationality, through a tradition of working abroad.

The fee structure for executive search normally equals 33⅓% of the successful candidate's first year's annual salary – which is little more than the cost of recruitment advertising. This is invoiced in three equal instalments, together with out-of-pocket expenses – but if the assignment is cancelled, the client only pays for the time spent on it up until that moment.

Korn/Ferry International additionally undertake not to remove any executive from a company once he is placed; also it will not take other executives from the same company for a period of two years after an assignment is complete – even if this were possible or required.

The computer industry is also unusual in another aspect: perhaps more than any other UK based industry, its executives tend to follow the American example by utilising its services as a part of their *own* integral career development. In the USA it is accepted that executives will "make themselves known" to the top executive search firms, not when they are redundant or unhappy, but simply to say "here I am, this is what I do, take notice of me."

In a fast moving world such as the computer one, every executive who takes his career seriously should do the same thing here in the UK. By taking this positive step, they may well be informed of positions of which otherwise they would be unaware, and move naturally from the slow to the fast lane. ■

•Full details can be obtained from David M[illegible], Managing Director of Korn/Ferry International, [illegible] King Street, St James's, London SW1. Tel 01 930 4475

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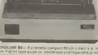

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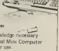

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GETTING STARTED

BIM

Within the next few years every manager will have access to a powerful microcomputer with which he will be able to solve many of his business problems This is clearly reflected in the size of the small business computer market It is estimated that the small business systems market will grow to $9 million by 1983, and this market will not be primarily for home computers or personal computers but essentially a market for business microcomputers Nonetheless the importance of the personal computer should not be underestimated as it represents inter alia a very important learning tool so that the would-be business user will be able to take advantage of the business benefits the better machines offer

We are often asked 'how does a businessman start using a computer? or 'how does he get into computing? The traditional answer to this question is to say that he has to define all problems, specify a system choose a vendor prepare for installation and implementation etc etc Now, although this approach is by far the safest way of introducing a computer to a business it is quite complex and perhaps even more discouraging to the businessman, as the procedure takes quite a long time Many businessmen are more than a little surprised when they learn that it can take anything from three (for very simple systems) to eighteen months from the decision to acquire a computer to the time it is up and running

There is, of course, another approach which will take the businessman into the computer age more rapidly Because small business systems can be very cheap and by very cheap we mean less than a few thousand pounds, and because there are now many good books and courses available from which one can learn how to use and program a computer, it is possible for many managers to move straight into computing themselves In fact there is good reason for every manager to start at even a lower level and buy himself a £100 computer

Of course, this computer will not be of any use in the office The buyer will in fact have to connect his £100 computer into his T V and use his home cassette to store his programs and data But the great advantage of having this machine is that he will *learn* about a computer and about computing No matter which assumptions one adopts about the future it is difficult not to reach the conclusion that by the end of the century which is less than 20 years away computing will be as fundamental a skill to every manager as the '3r's' are today So one of the ways to start acquiring these skills is to buy a machine at the low end of the market

By the way, the technology of these small machines is not yet such that this process of self learning will be all that easy Quite a lot of sweat and tears will be shed in reading the books and manuals and trying techniques again and again until they are used correctly, but when a computer is mastered there is enormous satisfaction – and there is perhaps no better way of learning that teaching oneself

'He will learn about a computer and about computing'

After this, the manager can look at the more expensive system of up to a couple of thousand pounds and start using this type of machine in his office Of course he cannot expect at this stage to be able to write sophisticated software In fact if he could write simple programs to remove onerous and repetitive calculation type work he would be progressing well With more reading and another course in more advanced programming and perhaps some study of systems analysis he would be able to develop some commercial systems such as debtors or stock And as time moves on computing would become one of his basic skills

Certainly if today's managers do not take up this challenge they will experience more and more competition from today's school and university leavers who will come into business with computing skills with which they will be able to perform tasks which managers cannot do today

One of the ways the BIM assists managers to get into the computer age is through its seminar workshop and conference programmes The GETTING TO GRIPS WITH MINI AND MICROCOMPUTERS programme, which gives participants a thorough briefing on mini and microcomputers as well as programming instruction and hands-on experience, is a positive first step In November the BIM will launch its first intermediate programming course which will concentrate exclusively on programming and give managers the necessary skills to write their own business programs

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THE HELMSMAN

Part IV

Attitudes and Techniques

In my previous articles in this series I have attempted to bring the point home that the discipline of management cybernetics is a way of thinking and a practical methodology which focuses attention upon

- interactions and relationships among entities within the system
- interactions and relationships between a system and the wider environment in which it operates

These interactions and relationships are always changing due to many factors some of which we have already discussed in this series. These factors may cause uncertainties and anxieties among the individuals and various groups within the organisation affecting its image in the wider environment. In order to cope with such uncertainties, anxieties and organisational instability, cybernetic thinking emphasizes that an organisation should be regarded as

- a communication network
- an open system which can learn and innovate

In this context, it is essential that an organisation should create adequate conditions and provide good facilities for

- the receiving, processing and transmitting of reliable messages
- storing and retrieving of information

The range of possible new combinations that may be formed by any business system depends upon

- the range of information stored in the memory
- the analysis and synthesis of the flow of information
- the possible range of outputs
- selective recall of stored information

These can be achieved by making use of a digital computer. Its greatest advantage is its extraordinary versatility as, in addition to routine business tasks such as preparing payroll, it can be switched on for complex tasks of learning and innovation – two important requirements for any business enterprise to be ultrastable. For example it can

- simulate marketing behaviour in order to predict the decision of a consumer to buy a particular product

Amstutz* (1967) stated this decision in terms of the interaction between price, attitude and awareness and salesman selling effort. What is being modelled is the consumer's conscious decision to buy a particular product. This model eliminates a customer's decision to buy a particular product because he has happened to see it while shopping for something else. Amstutz formulated the shopping decision in terms of the consumer's probability of shopping and described it in terms of his perceived need for the product. Perceived need is considered as a primary factor in the decision of what a customer wants and this need can change over time quite substantially due to advertising, for example. This simulation model is based on the statistical theory of probability and attempts to eliminate some of the uncertainties which management faces in marketing situations and consumer's behaviour

- The computer can be employed in simulating, for instance, profit and loss accounts
- The computer can also be programmed for helping management to search for an answer to this type of question: how much did we spend on printing machines in 1979?
- The computer can also be programmed to test plans by applying methods of Risk Analysis, Bayes Analysis and Venture Analysis, the payoff and risk entailed in deciding on one course of action rather than another

These are some of the techniques of problem solving which are the tools of a management cybernetician who applies them whenever he/she is involved in tackling a problem under the following types of condition

- **risk state** – where probabilities of occurrences can be computed. The reader should know that a large number of business problems are identified as being under risk. For instance building a new factory
- **uncertainty state** – where the decision maker has no information about the possible outcome of a particular event. For instance launching a new product
- **partial information state** – where the problem solver has some information which can enable him or her to assign probabilities to the occurrences of the various outcomes
- **under conflict state** – where competition is involved. A great number of business problems fall into this category

I should have liked very much to demonstrate one of these techniques if I had more space available in this series. At this point suffice it to say that management cybernetics incorporates ready made techniques developed in other management sciences especially involving statistical theories. However if such techniques are not available, then heuristic programming (intuitive judgement, rule-of-thumb based on experience and rigorously analysed) may help the problem solver in formulating relevant hypotheses, and testing these may lead to a satisfactory solution. Finally, it should be mentioned that if heuristic methods are not applicable, a problem solver can try simulation techniques. Simulation means representing a real system by some abstraction which appears to be the same as the original system. I should emphasize that the techniques mentioned here are concerned with non-routine complex problem solving and decision making.

Problems and Perspectives

> I am aware of both the honour and responsibility that falls upon me in giving this inaugural lecture. The feeling of honour stems above all from being the first Professor of Cybernetics – or certainly one of the first – to be appointed. My sense of responsibility arises because Cybernetics is not an easy subject to either define or explain and many misunderstandings arise as to its importance
>
> *(F H George Dec 1968)*

This was the opening paragraph of an inaugural lecture given at Brunel Univer-

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*Amstutz (1967) *Computer Simulation of Competitive Market Response*, M.I.T. Press.

Cybernetics

sity. More than a decade has elapsed since and many books and papers featuring both pure and applied fields of cybernetics have been published. Yet it is not widely acknowledged and openly appreciated in business management although one can detect its use by many managers and writers of management. It is understandable that any body of knowledge which incorporates ideas concepts and methodologies drawn from well-established branches of both natural and social sciences can appear to be superficial as does cybernetics. As far as its application in the management of enterprises is concerned, the misunderstanding as to its importance and lack of interest in it arose because the earliest writings projected its image as a science which is concerned with natural systems and machines.

Whenever some writers intended applying cybernetics to business management, they rightly used analogies which were perfect and very interesting for the academic community, but they hardly impressed the average manager. Because these analogies were often drawn from fields other than business management, they created a feeling that cybernetics was too general and useful only at the conceptual level. On the other hand some writers produced texts on cybernetics – with a view to helping managers – in the form of tomes that were as heavy as they were complicated.

As I stated in my first article in this series cybernetics has an inter-disciplinary background and different theorists have generated their own terminology and notations (sometimes unnecessarily) which contributed to some difficulties faced in explaining it to non academics. In addition to this, some teachers and writers of cybernetics had their specialisms in subjects other than modern management studies. No doubt this also added some difficulties in exemplifying it for managers and demonstrating its usefulness to the individual and the organisation. Many writers also incorporated its ideas in their own chosen fields without even mentioning the word cybernetics — which has not helped its acceptance in management.

This difficulty appears to stem from the fact that the general systems theory and cybernetics were developed during the same period. Those who were interested in applying their concepts ideas and methodologies in management branched out under the names of systems thinking and cybernetics, both claiming huge benefits arising to the organisations by applying their science. In order to safeguard their own professional interest, they even criticise each other.

What difference can management cybernetics make to the running of a business enterprise?

Before I answer this question I should emphasize that now we have come a long way since the above quotation was contained in the inaugural lecture mentioned above. In the 1970s I witnessed more and more managers accepting management cybernetics as an indispensable scientific way of thinking whose methods can help in the analysis of structure and behaviour of business systems and assist in the decision designs in

- policy making
- directing
- controlling
- co-ordinating

organisational resources and activities towards the achievement of its goals. Definitions do not always reflect what a science can do and no doubt the original definition of cybernetics has kept many managers away from trying it. Here I have no intention of defining management cybernetics except to outline its field of interest which has benefited many post experience students (managers) and their organisations with whom I have been involved for some years. Now let me say that the answer to the above question is two fold. The difference made to running a business enterprise is in

- the change of attitudes
- the development of techniques

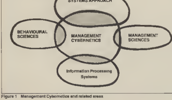

Figure 1 Management Cybernetics and related areas

In this series I have attempted to exemplify some of the important principles in order to emphasize that a change of attitude is essential for the adoption process. This can be achieved through the process of learning which means acquiring a new set of ideas – or even an old set of ideas, as long as the enterprise benefits from them. These principles might have appeared theoretical to some and workable at the conceptual level. Concerning this view let me at least raise one question.

How can one avoid pitfalls without the knowledge of their existence?

It is a question of training. In management situations cybernetics does this very well its inter-disciplinary nature changes management attitudes so that decision makers and systems designers treat the enterprise as a dynamic system rather than as a static one. We need to plan and design management systems which can be self-controlling and can be adaptive in order to maintain effective relationships with the external systems. Once management has realised that circumstances and goals change, then it should provide internal conditions and procedures for solving problems which require the development of techniques. Management cybernetics provides a way of thinking for developing algorithmic, heuristic and simulation methods and computer programs. For the analysis and designing of communication networks (sub-systems inter-connectivity, overlapping boundaries information flows environments and communication channels) it makes use of block diagrams and applies cybernetics principles. For the interpretation of organisational behaviour management cybernetics clearly overlaps with the behavioural sciences.

In this series I have mentioned the work of several behavioural scientists as they have applied cybernetic ideas in explaining organisational design. Management cyberneticians are interested in it to explore how the structure of a business system will influence the behaviour of individuals and groups and how their behaviour affects the system as a whole.

A model of management cybernetics

In my first article in this series I included a model of cybernetics and related sciences. In my opinion, it is a classical model which does not reflect the state of the discipline of management cybernetics in the 1980s.

Figure 1 shows a model of management cybernetics which I have developed and tested its applicability and suitability by introducing it to many managers and organisations (manufacturing enterprises insurance firms and the like).

In summary management cybernetics is a practical science which is concerned with information processing control communication and organisational design for an organisation's smooth survival in increasingly changing circumstances. ■

•*The series is now concluded. Saeed [illegible] is a management cybernetician*

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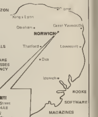

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THE COMPUTER AND COPYRIGHT PROTECTION

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Suppose you are a software house [illegible] one fine day you wake to find that someone is selling unauthorised [illegible] of your diskettes. These embody the [illegible] of several man years of skilled [illegible] effort or in other words [illegible] them cost you a sum of money in the [illegible] £100,000 or more. The cost [illegible] is a tiny fraction of that amount so [illegible] easily afford to undersell you in the [illegible] and make a handsome profit for [illegible]. What does the law have to [illegible]?

[illegible] of the problem is that the [illegible] *theft*! But there is no [illegible] known to the criminal law. (If [illegible] think that is unjust imagine what [illegible] the defendant claimed his [illegible] by a jury of average citizens [illegible] at random. What if [illegible] straight copy, he had [illegible] while still taking the [illegible] ideas?)

[illegible] unsophisticated people can [illegible] the concept of stealing some[illegible]. But the copyist has not [illegible] the sort. He has paid for [illegible]. Your investment [illegible] just as it [illegible] before. It's [illegible] that just [illegible].

[illegible] the first [illegible] but the [illegible] [illegible] CONST OF ORIGINATION » COST OF REPRODUCTION. But this [illegible] situation in the history of [illegible]. In the Middle Ages manuscripts [illegible] and the monks had to copy them [illegible] by hand. The [illegible] of so much effort and the [illegible] people [illegible] that [illegible] minded if his compositions were [illegible]. On the [illegible] he probably [illegible] it as a high compliment. This was [illegible] our formula didn't apply. The cost of reproduction was roughly the same as the cost of origination [illegible] less [illegible] extent [illegible] situation still [illegible] in certain branches of [illegible]. When David [illegible] December [illegible] to enable the computers of the Department of Psychology at Belfast [illegible] experi[illegible] I would guess that he might even regard it as a sincere form of flattery if a [illegible] another university asked to have a copy. In this case the original programmer was not expecting to get a return for his thought-investment except in the form of enhanced experimental [illegible] particular academic discipline.

But to return to the subject of manuscripts. When printing with movable type was invented it became possible to make copies at a fraction of the cost (measured in man hours) of the [illegible] had not lead to [illegible]. The reason was [illegible] trade was organised [illegible] guild with disci[illegible] would be the envy [illegible]. However in [illegible] down espec[illegible] stopped trying [illegible]. By the early [illegible] complaining of ruin [illegible] in which [illegible] to persuade him [illegible] of his own [illegible] after it was first published. At this point it was realised that the only thing [illegible] was to make a law prohibiting copying. This was the origin of the copyright [illegible] you have the legal right to prevent [illegible] copying your work it is obvious that you can allow him to do so provided he [illegible] you on mutually satisfactory terms. This is called licensing. Instead of doing that it might suit you better to sell your right to stop the copying to someone else, a publisher for example. This is called assignment ▶

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It was gradually realised that the same principle ought to apply in the case of other productions of the human mind such as engravings sculptures plays music paintings drawings photographs records films and so on As we shall see presently software and firmware are within the copyright laws They are particularly dramatic candidates for inclusion since in their case it is especially true that the cost of reproduction is trivial in comparison with the cost of origination

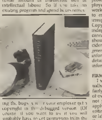
You may ask, what has a system of law concerned with elegant poems and beautiful paintings got to do with databases debugging and diskettes? The answer is quite a lot As it happens the Victorian judges who developed the copyright laws probably cared little for aesthetics their attitude was gritty and commercial When a man expended efforts in composing a street directory, or a railway timetable, or a collection of trade statistics or a book of logarithms they lost little time in extending the law to cover these useful productions of the human mind 'The true principle in all the cases sternly said Vice Chancellor Hall in 1874 is that the defendant is not at liberty to use or avail himself of the labour which the plaintiff has been at for the purpose of producing this work, that is in fact merely to take away the result of another man's labour or in other words his property

A company devised a code for sending telegrams so constructed that the risk of errors in transmission was minimised It consisted simply of a large number of 5 letter words with no meaning in any know human language It was held that this useful production (which was of course gibberish to the layman) was an original literary work This was as long ago as 1917

More recently it has been held that ordinary engineering blueprints are original artistic works (This should serve as a warning in copyright law phrases seldom have the meaning attributed to them by the intelligent man in the street)

HOW COPYRIGHT PROTECTION IS OBTAINED

In this country you do not have to comply with any formalities in order to get copyright protection It arises as soon as the work is written down Although he may not realise it the man who writes a letter to his lover becomes an instant copyright owner All you have to have is the right nationality or country of residence and nowadays that includes most of the countries of the world Even if you do not belong to the right country you can still get protection by first publishing it there But it should be emphasised that as a general rule, copyright protection arises even if the work is never published On the other hand the law does require that it should be a work of a kind which is protected As far as the computer industry is concerned what are protected are original literary works (which include tables and compilations) and original artistic works (which includes diagrams and any product of any process akin to photography eg chips) The word original is another one of these little misleading terms It does not mean that the work has to be unique or imaginative or not based on previous material It is sufficient if the work involved the expenditure of a non trivial amount of intellectual skill or intellectual labour So if you take an existing program and spend hours removing the bugs you or your employer get a copyright in the debugged version (Of course if you want to use it you will probably have to get permission from the owner of the copyright in the raw version for he too expended intellectual skill and labour in producing it) As a rough guide copyright protection lasts the life of the author and 50 whole calendar years in the case of photographic work it runs out 50 years after publication



WHO OWNS THE COPYRIGHT

As a first approximation the author is the person who acquires the copyright in a work If the work is composed jointly by two or more authors they become joint owners However if you produce the work as part of your job with an employer it is he and not you who is the first owner of the copyright he is not paying your salary for nothing If you are a software house and you use free lance program writers it is a good idea to have a contract saying that the copyrights are to belong to you (If you don t you may still be able to compel the programmer to assign it to you but this leads to unnecessary complications) If the work was made (or first published) under the direction or control of the Crown or a government department the copyright belongs to the government Of course once you are validly the owner of a copyright you can sell it to someone else or grant him an exclusive or non exclusive licence

PROBLEMS

Until quite recently creators of software were not too concerned about copyright This was because their products were not made available to the public generally So they could rely on the law of contract and trade secrets to protect their work For this reason there are still no cases in the law reports concerning copyright in software However with the advent of cheap micro computers and home users the commercial background has dramatically altered and there can be little doubt that an exciting new chapter in the history of copyright law is about to begin In the rest of this article I want to examine some of the problems that are likely to arise when the courts have to apply the existing principles to meet this new situation

Those principles are (1) copyright law protects skill and intellectual labour employed in producing a literary or artistic work (2) I have put those words in quotes to emphasise that works are protected irrespective of aesthetic merit if any (3) Copyright is the right to stop copying the independent creator who does not copy cannot infringe copyright even if he should arrive at the same result by coincidence (4) Copyright does not protect a *general* idea or concept or a single item of information however, it does protect a detailed *collection* of ideas or pieces of information

FIRMWARE

I will take this first since it is conceptually easier Most firmware originates as a fairly abstract design concept At the risk of over simplification we can say that it is not protected at that stage (You might apply for patent protection but that is an entirely different thing) However sooner or later it will emerge in a *visual* form Take the analogous example of a chip There comes a stage in the design process when it exists as a circuit diagram However this merely states the logical interrelation of the components and does not show what a cross section of the finished product will look like We are not concerned here with the case of a copyist who is going to make an unauthorised photocopy of the circuit diagram which is obviously a rare event we are concerned with somebody who is going to copy the chip Although the circuit diagram is a drawing within the meaning of the Copyright Act 1956 and although as a general rule the copyright in a drawing is infringed by reproducing it in a three-dimensional form the Act also says that there is no infringement unless the finished produce (or a cross-section though it) actually *looks* like the drawing to a (reasonably intelligent) layman This 'lay recognition test was put in the Act to stop the draughtsman from getting a monopoly in the circuit as such

Now go on to a later stage The chip now exists as a design drawing perhaps as large as a room and it shows exactly what a cross-section through the finished product will look like It is this drawing in which we are interested A still later stage involves the production of the chip probably using a photographic process We are also interested in this because a photograph is protected by the Act Now suppose the chip is put on the market Let us also suppose that it is copied by a competitor to the extent that one or more cross sections are visually similar. The manufacture of such a copy is therefore a reproduction in a material form of the design drawing (and also the photograph) and is an infringement of copyright. It is also a violation of the rights of the copyright owner to sell, import or deal in the pirate chips unless you can prove that you believed it was not infringing copy and had reasonable grounds for that belief. (For example, you might have believed it was a licensed version.) There is an anomaly in the present law in that the infringing copy is treated in law as the property of the copyright owner. This means that it can be an expensive business to infringe the copyright for you may have to pay damages calculated as the actual value of the article without being allowed to deduct your manufacturing costs and overheads.

Although I have tried to illustrate the basic point by reference to a chip, the same principle applies to firmware in general. If it is *ultimately derived* from an original or photograph, which it resembles vaguely, there will be infringement of the artistic copyright in the drawing or photograph unless the reproduction is licensed. We are back to the old principle that you are not allowed to misappropriate the skill or labour that went into depicting the product. It is no defence that the copying has not been exact, if the result still looks much the same, or that not all of the work has been copied, provided a significant part has been. In each case you are still taking a substantial part of the other man's skill and labour in depiction. Of course, if you alter the product enough there comes a point where it is not an infringement, and it is often difficult to know precisely where to draw the line. However it is impossible to go into any detail on that topic in this article.

SOFTWARE–BASIC PRINCIPLES

Unlike firmware, which usually depends on the existence of an original artistic work for its protection, and hence ultimately on visual similarity, in the case of software we are concerned with what the Act calls original 'literary works'. As explained, these works are protected even if there are no fine literary sentiments involved. For present purposes what is relevant is that copyright can protect the skill and labour that went into assembling together a series of verbal or numerical statements even if originally written in a 'language' which is unintelligible to laymen. In principle this would include a program written in a high level language such as FORTRAN or BASIC or even in a low level language such as machine code. Since the Act defines 'literary work' to include any written table or compilation it is obvious that a database is a likely candidate for protection.

ALGORITHMS

It used to be thought that copyright can never protect the collection of ideas or information present in a work but only the actual form of language employed. However it is now being realised that this is not so. Remembering that the basic principle

Copyright

is that you are not allowed to misappropriate the skill and intellectual labour that went into making a work, it is obvious that almost any literary work involves two sorts of creative input: (1) the skill and labour in assembling the ideas and data and (2) the skill and labour in expressing them in particular words or symbols. Therefore it is possible to infringe the copyright if you misappropriate (1) even if you put it into your own language, in other words, even if you do not misappropriate (2). Of course a *general* idea, or a few snippets of data, are not protected. It follows that there could be infringement of copyright in a program if a detailed algorithm or a substantial part of it is taken, even if it is expressed in different language, and even if the material is deliberately 'scrambled' or interspersed with extraneous or irrelevant material.

HOW CAN YOU PROVE COPYING?

Where the same form of expression is used it is usually quite easy to prove copying since a court is unlikely to believe that two identical detailed products were arrived at by sheer coincidence. Where however the copyist is astute enough to take the trouble to attempt to disguise his product, or where the algorithm is taken but expressed in another language, the problem is rather more difficult. However this situation is well known even in the field of conventional copyright. After all, how do you tell that a table of logarithms has been copied, instead of being calculated independently? The answer is that the copyist is almost certain to reproduce the mistakes as well as the good parts. It is therefore quite common to introduce a few harmless mistakes into works of that kind in order to detect piracies. The same techniques could also be used in the software field. (Cynical readers will say that there is no need to do it on purpose – there will be enough unintended errors anyway!) Besides, programmers tend to have their individual styles, quirks and eccentricities in their approach to solving a problem and these can be spotted by experts.

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In the market it is clear that he is unlikely to escape detection for long. But what about the sort of infringement which only goes on behind closed doors? This would occur for example if a company made copy diskettes for its own internal use instead of buying the legitimate product. In recent years the courts have evolved special remedies to meet that kind of case. They have made orders compelling alleged pirates to admit the copyright owner's representatives (headed by his solicitor) onto their premises to search for offending material. No warning is given of the intended visit and the first the defendant knows about it is when the search party arrives on his doorstep. This is to prevent unscrupulous defendants from destroying the evidence. Such orders are frequently made in gramophone record piracy cases.

MUST SOFTWARE BE EXPRESSED IN WRITING?

Where software originates as a written document there is no difficulty in saying that the manuscript is a 'literary work'. The kind of notation employed does not matter. However, where the software originated as material typed directly onto the keyboard into store the situation is less clear. Some lawyers think that a literary work cannot be protected unless it is expressed in some form of visible writing. However others, such as myself, think that an original literary work is protected as soon as it is reduced to any material form such as a tape recording.

Copyright

INFRINGEMENT OF COPYRIGHT IN SOFTWARE

So far I have referred to protection of software without trying to deal with the sort of activities that might be held to be infringement of the copyright except in broad conceptual terms. But it will be obvious that not all uses of a literary work infringe the copyright. For example, if I borrow a copy of a pirated novel and read it, I am 'using' the literary work but I am not infringing the copyright. The Act states what activities constitute infringement and for present purposes these include (1) reproducing the work in material form, (2) publishing the work, (3) causing the work to be transmitted to the subscribers to a diffusion service, and (4) making a translation of the work. Since reproducing a work in a material form includes making a gramophone record it seems that 'by analogy' it is infringement of the copyright in software to embody it in a tape or disc. It is not clear whether this concept would cover feeding a version into semiconductor store. Where a program written in a high level language is fed into a computer the internal compiler or interpreter will convert it into machine code. The latter is a low level language which the computer's central processor can obey. It would seem to follow that this could involve infringement of copyright by making a translation. After all, the Act does not say that it has to be a translation into a *human* language.

ARTIFICIAL INTELLIGENCES

Since the length of copyright protection is tied to the life of the author it is clear that as the law now stands the latter must be a human being. This is going to create problems in copyright law where the real author of the work is a machine. Since I have tried to keep this article reasonably uncontroversial so far I think that I should be allowed to end on a note of sheer speculation. It is not impossible that the time may come when machines have advanced to such a point that they will have to be given legal personality. This may mean that it would be possible to sue an artificial intelligence directly instead of suing its owners. (It is already possible to sue a ship for causing collision damage. Ships can also be arrested.) It may even come to pass that an artificial intelligence will be given the right to sue others, even human beings. If this happens it will be possible to say that artificial intelligences enjoy a limited form of civil rights. ■

■ *Peter Prescott*

Editor's note This topic can only be treated superficially in a magazine. The author is a barrister specialising in intellectual property law (and has an M Sc in nuclear engineering). He has co-written a book just published by **Butterworths** with Mr Hugh Laddie and Dr Mary Vitoria. Its title is The Modern Law of Copyright.

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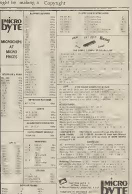

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UTILITIES	
SHAPEMAKER	[illegible]
SOFTWARE UTILITIES	[illegible]
PROGRAM INDEX	15.00
BUSINESS	
STOCK CONTROL	50.[illegible]
WORD PROCESSOR	40.00
LABELLER	20.00
GAMES	
APPLE INVADERS	[illegible]
AIRCRAFT SIMULATOR	[illegible]
BACKGAMMON	[illegible]
SARGON [illegible]	[illegible]
MICROCHESS [illegible]	[illegible]
BENEATH APPLE MANOR	[illegible]
SPACE INVASION	[illegible]
[illegible]	
[illegible] DEPTH CHARGE [illegible]	
CHECKERS/OTHELLO/YAHTZEE	
PINBALL [illegible]	[illegible]

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Mixed Colour Text!!!

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Existing Software Compatible
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Complete System including 14in Colour-Monitor £415 00

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Demonstration Software
Supplied

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2-CHANNELS ON BOARD
WITH OUTPUTS FOR PEN LIFT AND PAPER MOVEMENT

	£
8 Bit System	136 00
12 Bit System	216 00

All prices exclude VAT

Shiv Datt graduated in electrical engineering from the University of Southampton. He has worked and travelled extensively between the U.K. and India and has gained valuable experience in computer systems for most commercial practices. He is now working with Delta Conversions Limited and its chief co-ordinator in India

An Economic Conversion of Resources

A Third World nation of talented and hard working people makes its bid for a slice of time in the Computer Age

Having achieved a high degree of industrialisation and within 33 years of achieving independence, having entered both the Atomic age and the Space age India still has one of the lowest GNP/Capita in the world[1] The perspective of nation building in a country covering over 2 million sq m and with 650 million people is indeed different

The technological development of the country has been prompted largely by –

- A desire for technical autonomy and national self reliance
- A commitment to research and development
- An ability to impart a high degree of technical training and education
- A policy of accepting and developing on structured building blocks from the West

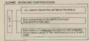
TECHNO ECONOMIC CONTRADICTION
INDIA
9th LARGEST INDUSTRIAL NATION IN THE WORLD
NUCLEAR CAPABILITY IN DESTRUCTIVE AND NON-DESTRUCTIVE USES
SUCCESSFULLY LAUNCHED ITS FIRST ROCKET POWERED SPACE VEHICLE IN JULY 1980 ENTERING A SATELLITE INTO ORBIT

Fig 1 – Highlights of India's Technical achievements

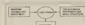
WESTERN TECHNOLOGY INVESTMENT
CONVERSION
TRAINED INDIAN ENGINEERS AND INFRA STRUCTURE
ECONOMIC ADVANTAGE

Fig 2 – The Process of Conversion

THE CONVERSION PROCESS AND RELEVANT AREAS

What, then is the conversion process and how does the West stand to benefit?

The India West cost ratio varies between 1:4 and 1:8 In the context of global economic competition the advantage is high Imagine a UK software house cutting its software development costs by even 50%!

This is the background against which India offers its services They are aimed at the complete spectrum of the industry including hardware manufacture software houses and end users, whether for designing and developing new products or upgrading and updating new products to new techn[illegible] applications as detailed below

The design and [illegible]

- Micro pr[illegible] systems built around [illegible] Z 8000 Z 80 [illegible] any other type [illegible]
- Computer syst[illegible] architecture using AM2901 [illegible] AM2903 6701 74S481 type chips
- Microprocessor based [illegible] and Validation systems
- Single board computers
- Peripheral controllers [illegible] hard disk drives (fixed and [illegible]) floppy disk drives mag type [illegible] keyboard display units line [illegible] printers and dynamic semi conductor memories [illegible]
- Dumb or intelligent terminals with RS232 interface

ACTIVITY	STATUS		REMARKS
	WEST (USA)	INDIA	
a. First computer developed	Early 40s	Mid 60s	High lag
b Computerisation began	Late 50s	Mid '60s	Low lag
c Formal education/training	Mid '50s	Early '80s	Low Lag
d Development and use of micro-computers	Mid '70s	Late '70s	At Par
e Mainframe development	Advanced	Primitive	High lag
f. Semi-conductor technology	Advanced	Primitive	High lag
g Peripherals development	Advanced	Intermediate	Low lag
h Software expertise	Advanced	Advanced	At Par

Fig 3 Comparative status of the Industry

ITEM	MEDIUM/LARGE SYSTEMS	MINI SYSTEMS	MICRO SYSTEMS
Installations (Approx)	100	400	500
Manufacturers	3	4	7

Fig 4 Numbers of Installations and Manufacturers

India

A range of software capabilities comprising

- A complete range of development aids such as Cross Assemblers Assemblers Simulators Link Editors Monitors Debuggers Text Editors and so on for micro mini and larger systems
- Utility routines such as SORT MERGE COPY EDIT File Management and other housekeeping routines for micro mini and large systems
- Software conversions for updating and upgrading of existing systems
- Compilers Interpreters for languages like FORTRAN BASIC EXTENDED BASIC COBOL Pascal and documentation in the same
- Text processing on hard and flexible disks
- Multi user BASIC on micro-computer systems
- Distributed Data Processing and interactive systems
- Database Management systems
- Micro coding for micro-programmable systems including emulation of any computer architecture Fixed and floating point arithmetic scientific packages and micro diagnostics micro assemblers and simulators

Systems design development and implementation of Program Products with structured design of files Input/output formats data structures and programs Areas of applications include

- Financial Accounting Inventory control Payroll Sales Purchases and Costing
- Project Planning and Monitoring
- Statistical analysis and routines
- Computer aided design
- Digital/Hybrid Simulation of industrial processes

Assembly of electronic components in India
The Government of India has recently created a free trade zone near Bombay SEEPZ (Santa Cruz Electronics Exports Processing Zone) backed by a complete infra-structure utilities and facilities in order to establish a self sufficient base for the fabrication and assembly of electronic components and sub assemblies in India A number of Western companies are already availing themselves of this facility and products include video cassette recorders consumer electronic items computer systems and peripherals and so on

HISTORY AND DEVELOPMENT

The growth of computer installations in India occurred in three stages Between 1955 64 16 computer systems were introduced primarily through educational and research institutions (Fig 5) During the second phase 1965 72 the process of computerisation really began and the private sector took the lead The third phase 1973 to date was characterised by increased computer power and better utilisation especially in the business sectors and Government organizations By 1978 there were around 450 computer installations in the country including the following machines IBM 370 155 ICL 2904 Burroughs B 6748 Honeywell H 400 DEC PDP 11 70 Currently there are over 1000 installations in the country (Fig 4)

Typical characteristics of micro processor systems manufactured in India are

- Z-80 M 6800 Intel 8085 based CPU with 64Kb main memory
- VDU terminal with double case keyboard with programmable special function keys
- Flexible disks 5 & 8 single/double format
- Line dot matrix printers
- Extended BASIC and FORTRAN Compilers

Typical characteristics of mini computer systems made in India are

- 16 bit LSI Processor
- Upto 256Kb main memory
- Multiple hard disk drives

INSTITUTION	AID COUNTRY
Indian Institute of Technology Kanpur	USA
Indian Institute of Technology Delhi	UK
Indian Institute of Technology Madras	West Germany
Indian Institute of Technology Bombay	USSR
Indian Institute of Technology Kharagpur	UNESCO
Indian Institute of Science Bangalore	UK/Switzerland
Tata Institute of Fundamental Research	UNDP

NOTE The Indian Institutes of Technology are the doyens of Indian Universities for pure and applied Sciences

Fig 5 Training establishments

ORGANISATION/S	PURPOSE
Indian Institutes of Technology Indian Institute of Science Tata Institute of Fundamental Research	Production-oriented research
National Centre for Software Development Computing Techniques (NCSDCT)	Growth of computer technology and computational practices
National Informatics Centre (NIC)	Development of methodologies for designing & implementing national information systems and data management techniques
Semi-conductor complex	Development & manufacturing LSIs LEDs micro wave semi conductors micro-processors computer memories etc
Computer Maintenance Corporation	1 Develop an indigenous base for computer services 2. Provide maintenance support 3 Procurement & distribution of spares tools etc 4 Systems support software and consultancy
Regional computer centres	Countrywide DP centres with mainframes and DP facilities for government public, and private sector users in the area

Fig 6 Infrastructure

HARDWARE/SOFTWARE DEVELOPMENT

SHORT RANGE PRODUCTION WITHIN 1 3 YEARS	MEDIUM RANGE GESTATION PERIOD 4-6 YEARS	LONG RANGE GESTATION PERIOD 6 10 YEARS
a Computer components such as SSI, MSI LSI [illegible] and magnetic core memory	a. Semi-conductor memory	a Exotic peripherals such as non-impact printers photo-optic printers, large screen displays etc
b Computer peripherals for small and large computers	b Microprocessor based instrumentation	b Magnetic bubble memories, charge coupled devices laser memories etc.
c Special purpose computer systems for process control, power generation, [illegible] exploration, as well as FFT analysers and programmable controllers	c Communication peripherals including modems	c Remote sensing, image processing etc
d Consumables including mag-tapes and floppy disks	d. Development of software tools compilers database systems, etc	
e Multi layer boards and aluminium hardware	e Process control software	
f Standardisation	f Exploration of software export	
g Manpower training	g Advances in architectural configuration of computers	
	h. Establishment of production technology for large scale production of computers and complex electronic equipment	
	i Use of Indian languages in computers	
	j Computer aided typesetting and printing	
	k Opto-electronic devices	

Fig 7 1978 83 Development Plan

- •Multiple Tape Units
- •Line Printers
- •Multi terminals
- •BASIC COBOL FORTRAN PASCAL Compilers

TRAINING

Figure 5 shows the various educational and research institutions established with foreign aid for promoting pure and applied sciences

Each of these centres has one or more in house mainframes with sophisticated facilities for both R & D as well as formal courses in computer sciences to students PASCAL has become a standard language and microprocessor based systems have become subjects for second year undergraduates

Additionally, of course hardware manufacturers and software houses provide considerable on-the-job training and experience in both the domestic and international environments One Indian hardware manufacturer has just entered a joint venture with the Singapore Government (against global competition) for manufacturing advanced microprocessor systems for the international market Another Indian software house has been collaborating with Burroughs Corporation amongst others in the international market for a number of years

PRIORITY AREAS FOR COMPUTERISATION

FIRST PRIORITY	SECOND PRIORITY
Paper	Pharmaceuticals
Coal	Petrochemicals
Oil exploration	Chemicals
Agriculture	Air-traffic control
Food supply	Other process industries
Power generation and distribution	
Cement	
Steel	
Fertilisers	
Railways	
Hospital information systems	
Government informatics and database management systems	
Computer aided typesetting and	
Printing	

Fig 8 – 1978 – 83 Development Plant

GOVT. EXPENDITURE COMMITMENT TO 1978 83 PLAN

Amount in millions of Rupees (US$1 = Rs 8 approx)

A	*Continuing schemes*	
	1 Electronics Trade and Technology Development Corpn	30 0
	2 Computer Maintenance Corporation	40 0
	3 Semi-conductor Complex	152 0
	4 National Informatics Centre	81 5
	5 NCSDCT	4 0
	6 Regional Computer Centres	42 0
	7 Industrial electronics Promotion Program	7 0
	8 Standardisation testing and quality control	68 5
	9 Special components and materials	80 0
	10 Headquarters	5 0
	TOTAL CONTINUING SCHEMES	480 0
B	*New schemes*	
	Software and firmware Promotion Programs	8 0
	TOTAL NEW SCHEMES	8 0
C	*Science & technology*	
	1 TDC Projects) 2 NRC Projects) 3 Defence Projects)	300 00
	TOTAL SCIENCE AND TECHNOLOGY	300 00
	GRAND TOTAL 5 YEAR PLAN OUTLAY	788 00

Fig 9 1978-83 Development Plan Expenditure

THE CURRENT SCENE

Hardware

The emphasis on current development work is on large systems and mini/micro systems for example

- •32 bit computer systems (not yet available for commercial use)
- •Multi processor systems
- •Closed coupled networks
- •Zilog Z 80 Motorola M 68000 and Intel 8088 based microprocessor systems
- •Peripherals including line printers floppy disk drives hard disk drives mag tape drives etc

Software

Various groups have developed/are developing

- •Operating Systems for closed coupled networks
- •State health information and control systems
- •Database systems for the Ministry of Finance and the Department of Revenue
- •Computerisation of Indian standards
- •Computer networks
- •Teleprocessing networks for banks
- •Action control systems for defence
- •Multiprocessor large systems
- •Computerisation for the railways airlines steel power process plant and numerous other applications

INFRASTRUCTURE

In order to promote the development of computer systems within the country the Technology Development Council (TDC) was set up with a high priority by the Electronics Commission to catalyse this development The TDC encouraged the establishment and growth of the organizations set out in Figure 6

1978-83 NATIONAL COMPUTER ELECTRONICS DEVELOPMENT PLAN

In order to create the framework for planned development in the field a three stage plan covering 1978-83 was evolved. (Figures 7 & 8)

It is worthy of note that in real cost terms the quantum of development costing Rupees 788 million in India would cost US$788 million in the USA!

The resources of developing nations are superficially cheap But in macro economic reality they only become cost-effective if they are competent and efficient ■

•This article has examined the computer [illegible] in India and suggests utilisation of Indian [illegible] by Western companies as a viable and [illegible] economic alternative Delta Conversions Ltd UK has been established to offer just this [illegible] by its presence in the UK as an intermediary [illegible] overcome the stigma of delay and unreliable communication attached to business [illegible] India Delta Conversions [illegible] Poplars Milton Abingdon Oxon OX14 4EH (Tel 0235 831449) and [illegible] Friends Colony New Delhi India (Tel. 6307[illegible])

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D/E LEDGER ☐
INVOICER ☐

FILING CABINET ☐
YEAR PNR PTR ☐
PROGRAM MART ☐
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MORE DETAILS ☐

The Apotheosis of the Cash Register

Well [illegible] The p[illegible] is becoming omnipresent and omniscient Let's hope it doesn't acquire the third attribute of divinity [illegible] omnipotence

In the future you will not need to go to a shop to buy goods but just order them from your television which will of course be connected to a computer

And if you think this sounds like pie in the sky just pick up a July/August issue of the *Harvard Business Review* for a persuasive argument of this premise

Conventional media advertising such as billboards broadcast television radio and the press tends to be passive The buyer does not necessarily have the goods in front of him

But with the interactive television such as Viewdata in this country and the Warner Communications QUBE system in Columbus Ohio the buyer can make his purchase there and then without even seeing the goods

That is still in the future, but the process is in the making Industry pundits are already talking of the retail banking interface'

Racal the giant electronics conglomerate has recently launched a point-of-sale terminal which will eventually connect directly into the banks electronic funds transfer systems (efts) so that a customer's credit standing can be instantly verified and his bank account automatically debited

Retailers and supermarket chains tend to equate market competitiveness with bigness, both in terms of store size and geographical spread around the country

The scale of operations of such huge cash-driven enterprises has made it necessary to develop the modest cash register into computerised electronic point-of-sale **(epos)** terminal devices to overcome their immense cash control problems

The whole epos market is booming because microprocessor programmability is making the technology increasingly available to smaller concerns too

The cost of such terminal equipment has dropped 40% in real terms since 1971

The new generation of epos terminals is becoming more programmable We are seeing less reliance on store controllers to drive terminals

According to figures published in the *Retail Management Data Book* there were 5 200 epos terminals installed in the UK by mid-1979 In addition IBM had 615 terminal controllers installed from its 3650 range

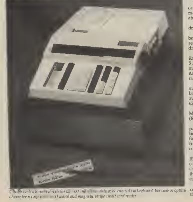
The figures also show UK retail turnover increasing from £15 billion in 1971 to £50 billion in 1979 against an increase in the average cost of an epos terminal from £2 000 to £3 000

The book is published by the Retail Management Development Programme (RMDP) and costs £400

The functions of epos terminals are expanding The majority provide data collection typically onto magnetic cassette tape for overnight transmission to a host mainframe for batch updating and stock control

The mainframe manufacturers such as IBM and NCR still have the edge on their competitors by offering real time online control over credit transactions albeit at the cost of expensive mainframes and controllers

Online control provides positive credit control which means for instance, that the teller can check whether the customer



Chubb cash's terminal sells for £[illegible]00 and [illegible] data to be entered via keyboard bar code or optical character recog[illegible] wand and magnetic stripe credit card reader has exceeded his/her credit limit Negative credit control on the other hand merely specifies that a particular customer should not be afforded credit facilities This type of information can be circularised without electronics

Epos terminals also provide better stock control than traditional periodic stock checks do as well as price lookup facilities

Another development in epos equipment is the availability of alternative input devices to lessen errors from terminal operator keyboard entry

Data may be input by means of optical character recognition (ocr) wands in the case of retail clothing merchandising or European Article Numbers (EAN) bar code readers for supermarket check-outs The main supplier of ocr wands is a US company called Recognition Equipment

Ocr is typically used in retailing (except for foodstuffs) and is a relatively expensive technology compared to EAN bar code reading technology used in supermarkets

Yet another development is that of the automatic bar code scanner instead of running a reader over the bar code label the operator merely passed the item over a laser scanner which inputs the price and other details to the terminal

Point of Sale

Data Terminal Systems look set to mop up some of that market pretty quickly with its Model 540 standalone scanning terminal

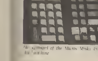
Other manufacturers scanners have to be driven by a separate controller, and this normally dictates that no less than about a dozen terminals will be economically feasible within such a configuration

The IBM [illegible] Goldbergs Glasgow

The first com[illegible] of the IBM Retail Store System in the United Kingdom is now in use at the Lan[illegible] store of A Goldberg & Sons Limited

The [illegible] system that enables department stores to streamline their accounting, stock [illegible] procedures for improved management control

The [illegible] sale terminal a merchandise ticket encoder a visual display based purchase order [illegible] and an in store controller which links the equipment with Goldberg s IBM System [illegible] computer



[illegible] of the Micros [illegible] line

IBM

IBM began its first major thrust into the epos market with two separate pieces of equipment for food and non-food environments the 3660 and 3650 register controllers respectively

The 3650 controller can handle up to 180 registers screens or ticketing machines in up to 25 different locations The processor microcode is defined from a document prepared by the customer compiled on a mainframe and loaded to the controller A 40 register configuration would cost roughly £2 600 per terminal

IBM s newer 3680 range is suitable for smaller stores and offers user programmability Up to ten 3683 terminals may be connected to a master register the 3684 which is in effect a diskette-based mini controller with two megabytes of storage A five register configuration will cost roughly £2 300 per terminal

The devices come from IBM s Data Processing Division (DPD) General Business Group (GBG) has its own stand-alone terminal, the 5260 An adaptor unit allows satellite 5266 terminals to be attached to a 5265 to share diskette storage

NCR

NCR, with its background in both computers and cash registers, is a natural contender for the epos market

The company has installed around 3,000 terminals in the UK. NCR s range starts with a simple electronic cash register the 2116, which is selling for about £700

The 2140 starts at £3 000 and provides data capture onto cassettes

A supermarket system with ten Model 255 checkout terminals connected to a T8255 controller will cost roughly £37 000 A 30 checkout configuration will cost around £90 000

A department store configuration with 60 Model 2152 terminals connected to a T8250 controller will cost around £215 000

Chubb

Chubb Cash launched its CR3 series stand-alone epos terminal one year ago and has to date installed over 100 of them

The system is manufactured by Datatrol in the US and can be connected to Digital Equipment (DEC) Data General and Digico minicomputers

It can handle over 200 different types of transactions provides over 50 user selectable totals within the machine and can analyse stock movements accounts and orders as well as sales The system sells for £2,300

A computer-driven matrix printer prints bar-code labels for every product on the shelf When a sale occurs, the machine reads the code and provides stock control sales analysis, VAT accounting and ordering information and prints fresh labels for replacement stock

DTS

Data Terminal Systems (DTS) claims to have installed around 175,000 epos terminals worldwide, of which 5,500 have gone to the UK market

The range starts with the Model 150 which is basically an electronic cash register without any expansion potential

The 200 series is a low-price system selling for £800 to £1 500 It provides inter register communications and a communications interface for host transmission

The Model 551 is an inventory control system for small branches carrying up to 12,000 items and provides a re-order level facility The Model 515 is a general purpose terminal

Up to 30 Series 200 or 500 terminals may be interconnected in a daisychain by utilising the inter register communications feature available in each terminal any of which may act as master terminal, polling data from the rest

DTS recently launched its 700 series manager's terminal based on Digital Equipment (DEC) PDP11/02 and 11/32 minicomputers for back-end file maintenance and processing, or front-end stores control.

Fieth

Fieth makes Z80-based customised epos equipment from standard board modules The company argues that in this way users have the benefit of a gradually phased implementation without replacing equipment

Prices start below £1,000 but the system may be retrofitted with up to 64 Kbytes of memory and boards for scanner ocr wand visual display unit communications interfaces and floppy or hard disks

The company has installed over 500 terminals in the UK

Hugin

Hugin Cash Registers, a Swedish manufacturer has six epos installations in the UK comprising over 1009 terminals, and claims to have orders for another five installations

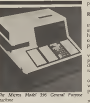
Hugin s attack on the epos market is based on stand alone terminals the H100 range the interactive terminals connected online to Philips 850 series minicomputers, the H310

At the top of the H100 stand-alone range is the H150 which provides analysis on up to 28 departments 255 sub departments 682 price look-ups four payment methods 15 sales persons and four cashiers

The system has some programmable functions and up to four of them may be connected to a digital data capture cassette recorder price £2 000

The Hugin epos system comprises up to 50 interactive online H310 terminals linked to a Philips 850 series minicomputer providing in depth management information for up to 50 000 articles on an 80 megabyte hard disk

A reporting package prints exception reports on stockholdings and the system may have ocr and EAN printer readers attached to it The terminal sells for £1 800



The Micros Model 396 General Purpose machine

Norfrond

Norfrond sells a range of epos equipment manufactured by a US company called Micros with prices ranging from £1 800 to £3,500

The system can be used as a general purpose terminal for up to 6 000 price look ups, but is also available for specific applications such as hotels, fast food chains grocery stores remittance control terminals for local authorities and bar/restaurant counters

The bar restaurant [illegible] maintains a constant trial balance by double-entry posting of transactions

Real Time Control

Real Time Control (RTC) s 460 series introduced one year ago is essentially designed as a cash and-carry terminal RTC has so far installed 50 and claims to have orders for another thousand The basic price is £3 300

The system can generate customer invoices with VAT rates and can create reports showing trading performance by individual cashier department and VAT rate

Departmental information can be stored on a period basis to provide sales analysis with average sale and departmental performance

Corrective credits may be issued against refunds and a price look-up facility can address up to 1 000 items indexed by stock numbers

Options include a data capture cassette a communications interface bar code or ocr wand and a controller to link terminals

RTC is launching a general purpose retail epos terminal later this year This will provide departmental analysis price look up, stock control and a Data General Nova-based controller for up to 30 check out points It will cost from £2 000 upwards ■

Boris Sedacca is the [illegible] Computing

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Continued on page 87▶

THE CP/M GRAFFCOM OFFERING

[illegible]

New Book-keepers start here

How to control stock of goods for sale, parts for assembly, raw materials that factories use, spares and consumables for plant, transport or general maintenance. [illegible] the problem.

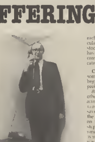
When there are only a couple of hundred different items, about the number of items in the company stationery cupboard perhaps, then a visual check will do: the empty space tells the story.

For up to a thousand items then, provided that the storekeeper is well organised, some form of Bin Record Card is called for. Card pinned to bin, enter goods as they arrive, check them off as they are used. If you don't do this then you forget to order low-stock items and suddenly you are fresh out of 3/8ths washers. Again.

Above a thousand items the problems compound. A weekly look round for items to be re-ordered now takes a long time. A very disciplined approach has to be taken to check stock against the bin card, checking just a few dozen items every day, otherwise the stock-taking differences at the year end are horrendous, some differences up, mostly down. They call it shrinkage but in fact it is probably carelessness in recording issues. Most difficult is the end of year stock valuation which produces a great number of single-space written sheets to be priced and extended and then added to give a total end of year stock figure for the annual accounts. What with interruptions, one client of ours with only 1300 stock items was taking two months, off and on, to value stock.

Computer systems come in several price ranges and the software offered with them normally gets more sophisticated as the hardware price on which it runs increases. The more the hardware outlay, the easier to justify a larger software outlay.

Class 1 – low entry systems like PET, Apple, Tandy, tend to have all the program in memory at once to save the problems of scheduling overlays. Limited in size therefore, and with a low budget price, the stock packages tend to offer five functions: Receipts, Issues, Master file update to insert and delete stock items, alter values and stock quantities for shrinkage update and cost and sale prices, Reporting



to list all the [illegible] items against specified minimum and [illegible] Stock taking [illegible] stock items on a continual [illegible] Nothing more but [illegible] charge [illegible] price.

The next step up is Class 2 [illegible] integrated with a Ledger [illegible] invoicing package [illegible] stock automatically to make [illegible] of stock. Two other things are [illegible] handled. Firstly [illegible] can be noted on the stock file and [illegible] order quantity [illegible] preparation. When the order is [illegible] it is deducted from the on-order quantity as well as added to the stock in hand. Secondly each stock item [illegible] classified into groups [illegible] sections of the business [illegible] and deducted [illegible] accumulated for the month [illegible] so that sales quantity and value can be analysed at each month end. At the same time particular stock items can be highlighted if stock is low, back orders are overdue or have not moved for some time. The Graffcom Stock Control package is in this category.

Class 3 is a bigger package available on some mini computers. At this level we begin to look at some interesting new problems.

80/20 Analysis In common with many other business phenomena *80% of the activity on the file is in only 20% of the item records*. This fact gives a clue to substantial saving in computer time. It can improve the system performance by concentrating on *only the active part* of the file. The first step is to identify the low cost/high volume items like washers and make them available in bulk for issue on demand. The washer bin is topped up at intervals in gross lots. Secondly, all the low movement or nil movement items are put on a separate file. If we ever have to look at this file it will take an extra few seconds but this is acceptable. Now all the effort of stock control is concentrated on the remaining 20% of the items. This cuts the paperwork substantially.

Availability It is uneconomic to stock up today to meet all the expected issues to meet the full customer order book. The optimum is for items to be ordered to arrive just a few days before they are needed for issue to production. So we log supplier orders on the file with a delivery due date. And we report stock levels into the future based on this information.

Commitment The other side of the coin is the allocation of stock to customers. Normally this is just a total amount so that if a request is made for an issue which is not preallocated then he can't have it unless there is free stock in hand. Some systems will keep a sub-file with customer order details and amounts allocated to substantiate availability. Graffcom has a total allocated facility but this is not associated with commitment.

Lead time The delivery lead time is noted as a guide to ordering, this time being associated with the minimum stock level to tell when to order.

Profit margin Salesmen give discounts to get orders. Although we put a sale price against the stock item it never seems to fetch quite that amount. Quite often there is a scale of discounts for particular groups of items of stock and an additional scale

An Integrated Accounting System

The Farmfax accounting packages described in the Book keeping feature in Issue 9 (August 1980) is now marketed by Findtas, 36 Kings Road, London SW3 4UD. The contact name is Mr Geordie Herbert.

for particular customers or types of trade. The trick is to record not only the quantity sold but also the actual net value realised for each sale against the stock item. So that at the end of the month you can analyse sales by product group taking into account the cost of each item and show the percentage profit achieved on turnover. Any unprofitable stock lines can be highlighted. The Graffcom package does have this feature.

The next level for **Class 4** is for advanced students only and is probably only justified on very large stock files and run on large mini or mainframe computers. The techniques are fascinating but use machine time as if there was no tomorrow.

Forecasting In view of the lead time for many items of stock, particularly if we are buying ex works or abroad and getting the best trade terms, we want to know how much we are going to sell. You can guess but there are probably several thousand stock items and mistakes can be expensive. The scientific way is to use the *past history* of sales to *forecast* the future. An average figure is easy, a 12 month rolling total gives this. But if sales are increasing or declining you can do better by logging sales by month at least for the past 13 months and loading the forecast to take more account of the most recent months than the earlier. This is called Exponential Smoothing. We can take out any seasonal peaks by deducting constant factors from each month as appropriate. It is also a good idea to take out any unusual transactions like special bulk sales which would distort the trends.

Economic Order Quantity Big orders, well ahead, get the bigger discounts. But if we order a big quantity we have to pay cash for it. The trick is to order enough now so that the end of the delivery lead time the forecast says we are just about to run out of stock. Then we round it up to the next bulk discount level to get the best terms.

Service Level Planning Some of the time we will guess wrong. So when a customer comes in with an order we are out of stock. If we aim for a 90% service level we do not have to hold very much stock. The nearer to 100% we aim for, the larger the stock. Some companies aim for 95% availability. We should log the stock-out occurrences to monitor performance. Graffcom logs unsatisfied requests but does not analyse them.

Cash Flow The accountant is going to have to pay for stock we order. It would help him if we could note down the delivery date, the value less all the discounts and also the payment credit terms. The accountant may work the other way and insist that we work within a cash budget. Life really becomes difficult then. The service level may well suffer.

Automatic Ordering There is no reason why the computer system should not print out the supplier orders. It may be that you trust the computer system and the orders can be sent out unchecked. Or sent by data transmission or on a floppy disk. But you had better look at the forecasting system. You don't want to re-order items you are trying to discontinue selling, it is so easy for spurious items to creep in.

Stock Control

New Computer Users Start Here

The Graffcom packages run under the CP/M(tm) operating system from Digital Research Inc, which is available on most micros which have **Intel 8080 or Zilog Z80** microprocessors. These include **Altos, Cromemco C3 and Z2H, Dynabyte, Heath Z89, IMS 5000, 8000, Micromation, North-star Horizon, Rair Black Box, Superbrain**.

The list represents a substantial range of machines of all prices and qualities. It is said that there are 20 million small business computers in the world and that 75% of these are capable of being run under CP/M. However the statistics tell only the potential. In fact there are only a dozen software houses in this country writing packages under CP/M and the total impact on the business market is not nearly as impressive. It may be that in the hobby and domestic market, particularly in the United States, the impact is greater.

CP/M stands for Control Program/Monitor and is designed to handle keyboards, displays, printers and disks in a standard way. So you can move your programs from machine to machine. You can upgrade to new bigger, faster, shinier models, or you can shunt your application across to another machine down the road for backup if your machine goes sick.

Using standard CP/M provided utility programs you can list all the programs and data files on your disk, erase files or groups of files, rename files, save the current contents of RAM memory to a file, type out files, copy files, find out how much free space is available, use an editor or debugger, and work with an assembler program. Up to 4 floppy disks can be handled either for sequential or random access. Probably most interesting is that the commands on the display screen are standardised so every program is addressed in a consistent way.

That is the good news. The not so good news is that each implementer has been allowed to go his own way from then on and this tends to destroy the beautiful standard environment we thought so good. For example the Graffcom programs are written in 17K CBASIC. But there are at least a dozen other BASIC interpreters in common use which are incompatible with CBASIC and each other. CP/M is for single terminal systems. MP/M is promised for delivery soon for multiple terminal systems. Meanwhile some implementers offer multiple terminal support under CP/M. Also they have added functions to CP/M to handle all the extra control keys on the keyboard and to provide better handling of the display. And for printer functions. And for indexed sequential file handling. Etc – etc – etc. In short, the brilliant, inventive entrepreneurial software houses are beavering away – destroying one of the very few standards we did have in the industry.

Nevertheless Graffcom are able with very little effort to make their software available on a wide range of good micros and this must be a plus for them and the user.

History

Graffcom Systems Limited was formed four years ago by Robert and Richard Owen. They now have four people full-time working on programs under CP/M operating system and another two on hardware development for engineering and scientific applications. There are around 120 users of their business software which is sold by dealers who take full responsibility for installation and support. The list of dealers alters over the months, ring Robert Owen on 01 840 3090 for the latest list.

Besides Stock Control they offer Order Entry and Invoicing, Sales Ledger, Purchase Ledger, Payroll and General Accounting and a Name and Address system. Coming soon are Word Processing and Financial Modelling packages. Prices vary between £500 for Payroll and £250 for Name and Address. Most customers seem to start with a Software Bundle No 2 which gives Stock, Invoicing and Addressing for £650 as an inclusive price.

Maintenance on Payroll costs £120 each year including the first. Small enhancements to the other packages are free if you send a blank disk. New versions are sold to existing users at cost, usually between £50 and £80.

Graffcom have a demonstration centre by appointment at Wessex House, Leyland Road, West Ealing, W13. Development work is at Twickenham. The company has done bespoke software for a number of customers, a time recording package for a firm of solicitors and another for engineers and a Lease Rental and Hire Purchase package for this particular type of invoicing.

Having spent over two years developing the Graffcom packages and 18 months in marketing them, sales are now taking off and the company is in profit, they reckon they have just now broken even. The company needs this profit but is also concerned to create a strong professional image as a reputable software house.

Graffcom Stock Control

You can get the flavour of the Graffcom package by looking at the contents of the Stock Master File. It is obviously more sophisticated than the simplest packages. It covers all the Class 2 facilities and even some of Class 3 and 4. It is designed to run with the order entry and invoicing package from the same supplier and can automatically release stock against invoices printed.

The system is driven by menus. Key the item number on the menu and the selected program is loaded into memory ready to run. The programs are compiled to an intermediate code in CBASIC and are thus compact and efficient. The added advantage, or disadvantage depending how you look at it, is that your staff cannot easily look at or amend the programs, thus preventing the potential fraud problems that easy operator amendment could otherwise bring. The source code is not available to the user. This helps prevent the package from being pirated. If you want any changes made Graftcom will do these for you at a fair price.

The manual printed on [illegible] paper is particularly well prepared and easy to follow. All the required display formats are shown with key by key instruction on how to use them.

The stock file totals 130 characters (bytes) per stock item and includes a 25 character stock description plus a five character product group code on top of a 12 character stock code which can be alphabetic or numeric or mixed as required. Sales quantity and value statistics are accumulated for the current month and year to date. These are extended on sales analyses reports for cost of sales by reference to the price information. Price information is last-actual-cost, average cost of stock in hand and Sales Price. A VAT rate code and a discount code are stored for use by the invoice programs.

A full price list can be printed out for issue to salesmen or customers if required. Individual items can be displayed on the screen on request.

Product Code enables reports to be prepared for major classifications of stock. It would be normal to name these with a meaningful five-letter description which would appear on the top of the appropriate analysis report. If you need a more sophisticated analysis then you may want to go back to Graftcom for a customised report program.

Stock can be allocated and is therefore automatically held back from the stock in hand and any issues that cannot be met are noted for statistical purposes as unsatisfied quantities.

A particularly powerful facility is for Stock Groups. You can define a stock item as an assembly and specify any number of components with which to build it. Components can be used for any number of different assemblies. If there is a quantity on hand on an assembly item this indicates that it has been made up or that the kit has been brought together to be made up. If you try and issue an assembly then the system will look first at the assembly stock and if not sufficient then it will draw off all the components required to build it. There are ways to remove a group and to print out groups for reference. A very neat option.

Whenever required the total value of the stock on hand at average cost can be displayed on the screen. This is the value for the monthly, quarterly or annual accounts. A full list can also be printed. It is not difficult to keep a note of the value in a record book and compare it with opening value, issued cost of sales and cost of goods received. Of course the figures should balance and of course they never will. And I guess a fraudulent operator could alter quantity on hand to cover some shrinkage and conceal this by a crafty increase in value elsewhere on the file. But these systems are designed to be run by responsible people and accuracy depends on their own diligence and good faith.

A second check is mechanical. The number of stock records on the file is displayed whenever security copies are taken off the master file. It is recommended that the date and time of taking input is noted in a manual log together with other useful information like hardware faults and the time on and off the system for each application. In this log an attempt should be made to reconcile the record count figures with the numbers of records added and deleted. This requires some manual action. It would be better if it was done by the computer program. Otherwise if you do happen to lose records you may never know. Of course it will never happen to you but...

Three other things I would improve. Invoice credits to customers do not get back into stock; you have to use the file maintenance program and you won't remember to alter the sales statistics. The handling of hardware errors when they arise seems to be weak. The error codes are displayed to the user but the only people who can sort out the problem are Graftcom. This is a function of the wide range of differing computers on which the system will run. And finally the use of the special keys on the keybord is not what I am used to. RUB or DEL deleted the whole line. Other Implementers use DEL as a back space to delete only one character. If you run packages from several different suppliers you may be confused.

The package seems to work reliably on all the systems offered. With 5-inch floppy disks the performance is no slower than these systems normally are. The new quad density disks are faster. Eight inch floppies are bigger and faster and some Winchester hard disks are supported. Capacity is approximately 350 stock codes per 100 000 characters of file. Multiple files are possible but not promoted; they need custom tailoring for the particular configuration.

How it works

One of the happy things about Graftcom programs is the continuing saga of a mythical company called Watson Industrials which is used to describe each of their packages. You can follow the Watson story line as you move up through the range. I print an edited version of the Stock Story here.

WATSON INDUSTRIALS are going to use the Stock Control system to control and monitor all stock items. These items include stock which is brought in and distributed and raw stock which is brought in for manufacture.

By using the Order Entry & Invoicing package, stock release of all products which are invoiced to customers will be automatically processed. However, for stock which is used for internal manufacture the stock will be released by the Stock Control package.

The first consideration is that each item of stock must have its own unique stock code. This stock code is the key used for reference and access to all items stored in the system.

Stock codes can also be allocated product codes. The use of the product code allows extraction of products lines on reports without producing a full listing of all stock codes.

Having established a stock code numbering system and product codes, WATSON INDUSTRIALS now needs to load the stock codes. The stock codes are loaded in batches of between 20 and 50 with a security copy run being made after every batch has been entered.

All the information that is known about the stock lines is input during the initial loading to save further editing later on. When all the stock codes have been entered, a full report of the stock codes on file is printed.

New stock codes are added periodically as new stock codes are assigned. Changes to stock code details can be made and stock codes which are no longer required in the system can be deleted.

WATSON INDUSTRIALS will use the stock groups program to group components which they sell as assemblies or kits. With this program stock group is defined together with its components and quantities. This can be printed out for reference.

Price lists are produced every 3 months having reviewed the selling prices. Price increases can be applied to all codes or selective on product code, raising prices by a percentage (like 10%) or a factor (x3) or by a specified amount (+10p). The price lists are produced on company letterhead by using the single sheet print option. Up to two lines of text can be printed as a price list heading.

WATSON INDUSTRIALS are going to monitor stock movement over monthly periods. As stock is released the system monitors the quantities and at the end of the month a stock analysis report is produced. After the report has been printed the released quantities have to be reset for a new period. This is done using the system maintenance module. The "no movements" report is now produced so that a check can be made on stock lines which have not moved over the last period.

The stock shortages report is produced daily. Using this report stock requisition orders can then be produced sorting individual items into supplier order and printing each supplier on a single document. These are then sent to the supplier with a covering front sheet which has the official order number or telephoned through to the supplier direct.

The on-order report can be produced at any time. This can be used for progress chasing.

When goods are received the files are updated from details obtained from delivery notes and invoices. When complete the system can produce a stock inwards report which will show all stock received in this batch and value of new stock together with the new current quantity for each stock line.

An enquiry program is used at any time to display the status of any stock code. This option is also used to allocate stock against customer orders. At the end of the day WATSON INDUSTRIALS use the Order Entry & Invoicing package; all invoiced stock is released automatically.

A stock code worksheet is produced periodically for reference.

Occasionally WATSON INDUSTRIALS will change suppliers depending on price and availability. Where a new supplier code has to be assigned this will automatically change all occurrences of a given supplier code to a new code.

WATSON INDUSTRIALS produce a monthly Profit & Loss account using the General Accounting package; for this the system will calculate the current value of stock which then can be used for posting to the Stock P/L account.

Due to the constant movement of data in the stock system WATSON INDUSTRIALS run security copies at the end of every day. ■

Richard Waller is with Spicer & Pegler Management Consultants

▶

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Stock Control

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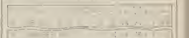

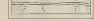

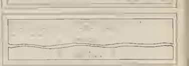

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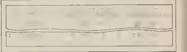

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SYSTEMS FOR BUSINESS

TEK Rubber and Plastics

"You don't get a Rolls Royce for the price of a Honda, and in the same way with IBM you are getting the very best that there is on offer." That view expressed by Peter Edwards, Commercial Director of TEK Rubber & Plastics Ltd, reflects this user's enthusiasm. With a large customer base and a wide range of products IBM has had to develop systems which can be used by both small and large concerns.

The IBM System/34 small business system arrived at the offices of TEK in the winter of 1978. Peter Edwards claims that the computer has saved £50 000 in less than a year through pinpointing losses from rising costs and control of stock. "One way that the computer has helped us is to control our own costs more effectively and to reduce these costs as a percentage of our sales."

The computer offers the opportunity of constructing a highly efficient, fast and cost-effective personal service; it boosts productivity. TEK staff have had their jobs upgraded, given the opportunity to use the speed and power of the computer, they have grown more creative with the system.

"The returns you get from it are tangible," says Peter Edwards. "It certainly has enabled us to view more critically the way we run the business, the number of customers we have, and the products they purchase. By eliminating certain product lines we will have lost 15% of customers but we can afford to do that because they hardly make a contribution to total profits." The computer has enabled TEK to keep track of back orders, out of stock conditions and inventory levels, at the same time cutting down on manning levels without any deterioration in service and support to the customer.

TEK supply industry with rubber and plastic hoses, together with hose fittings and conveyor belting. More than 60% of their product range is sold to the automotive industry, to such well-known names as British Leyland, Talbot and Vauxhall, the other 40% goes to companies in the plant and construction industry – Massey Ferguson and John Laing. Based in the West Midlands, the TEK Group has a current annual turnover of about £2½ million, yet only 50 employees.

TEK was founded in 1962 by Peter Edwards' father and two friends in a coal merchant's yard in the centre of West Bromwich. The three men set out to offer a fast and effective personal service to local industry.

Peter Edwards, Commercial Director of TEK Rubber & Plastics with the IBM System 34 small business system

In early 1970 the directors recognised that if they were to continue a cost effective customer support service, an additional depot would be required. A new company called TEK (Anglia) Ltd was set up in Newmarket.

It has a staff of 12 with turnover touching £½ million. The success of the East Anglia operation led to the formation of yet another company called TEK Hose & Hydraulics at Milton near Oxford. "With all this expansion and new building projects cash flow was obviously a real concern for us at the time," recalls Peter Edwards. "It was taking us on average at least four weeks to get invoices out to our customers and it was taking even longer to produce meaningful statements – typically four months!" Statements are vital to cash flow and Mr Edwards says that while half his customers will pay on receipt of an invoice, the remainder will wait for statements. "Since computerising our accounting procedures, we have now reduced the collection period from four months to four days," he says.

Peter Edwards joined TEK in 1973 as sales manager, following four years with Monsanto Chemicals (who were operating the IBM System 370) and then three years at Manchester University reading Chemistry.

His early work for TEK was to organise a strong sales force in an attempt to increase product sales and profitability. "But we had many problems within the company and we were not generating statements and invoices on time. Our accountants were saying that we would be out of business within six months if we didn't immediately resolve our cash flow problems. We could not afford to take on more customers! We had a lot of staff working on the preparation of orders and invoices but we still could not turn an order into an invoice without a two or three week delay."

At that time TEK's accountants, I T Field & Co, were setting up a computer bureau using the NCR 299, so some of their accounting problems were solved, but invoicing remained a problem with no stock control and little sales analysis. "We had 15 people in the sales department taking orders by telephone and using handwritten documents, photocopies of which would be sent to the warehouse for shipment. Usually the order would find its way back to the sales department later that day – suitably marked with the action taken," explains Peter Edwards. "Despatch notes were prepared for completed orders on four part forms. One copy went on to the next operation – pricing. Our discount procedure was not based on a set pattern, invoicing was done in batches on an erratic basis, and sales information was entered in the ledger spasmodically." They clearly had very little control over their own business, and to add to these problems, their accounting machine was on its last legs.

In considering the potential computer applications he went to IBM. "IBM are the most professional outfit I have ever come across in my 12 years of business and their sales people are well trained. IBM put forward their System 3 Model 6 at £28 000 but there was very little software or support, and the programs had to be written by the user himself or from outside vendors. It was expensive in terms of man hours in training myself or my staff to run the system," he says.

When I T Field, their accountants, purchased an IBM System/32, TEK entered into a time sharing arrangement on a 12 month bureau agreement. TEK bought the sales and purchase ledger, order entry and invoicing programs from the Bureau and their time sharing costs came to £750 per month. Seeing the lack of personal central in working with an outside computer bureau Peter Edwards says In these three years we were getting more efficient in our methods of operation but we were becoming dissatisfied with central time sharing system reliability

To develop a more effective computer strategy Peter Edwards went for the second time to IBM It was decided that an IBM/3740 Data Entry Station linked to the bureau System 32 would be the most practical and immediate solution A part time key operator Margaret Terry was engaged and work improved New orders were written on two-part stationery – one copy for the warehouse the other for sales Prices were added and keyed in as an order, 80% of the invoices were sent out within 10 days of the order followed by statements three weeks later with sales analysis information available two to three months after that This method of operation was just a stop gap solution because the company still did not have any credit control or stock control and were experiencing many errors through misprints and duplication

At this time, IBM announced their new System/34 TEK called in the IBM salesman and signed the contract almost immediately The equipment was installed in December 1978 on a monthly rental basis of £1 500 over an 18-month period with an option to purchase and TEK joined the first batch of new users with the Distribution Management Accounting System (DMAS II) set of standard software programs

The IBM System/34 is a product of the General Systems Div (GSD) of IBM which has concentrated on selling small- to medium sized computer systems to commercial users

System/34 is a multi user system programmed in RPG II four display stations an IBM 5211 line printer and standard software programs for the distribution business The DMAS II order entry invoicing, stock control sales ledger and sales analysis cost an additional £4 800 They have now gone for additional equipment and extra disk storage which Peter Edwards says will take care of their needs for another five to 10 years

One feature of the System/34 is the emphasis IBM place on training and utility programs to enable the user to do his own programming Standard software programs are well written and easy to use compared with programs from outside vendors Once the sale was made the systems engineer's role is to ensure that we have planned for the arrival of the equipment and once installed IBM were on hand 24 hours of the day seven days a week

The IBM systems engineer worked on site and often through the week ends to put right what had gone wrong in the past

TEK staff say that the System/34 is so easy to use that they were able to handle software problems without any outside help TEK decided at an early stage not to modify the programs instead they adjusted their method of operation to suit the system and Peter Edwards is certain that this decision has been to their advantage

By 1977, the company's West Midland operation was at a peak and they have since developed a flourishing export business to the Far East and many Third World countries Our cash flow is approximately £10 000 per day this used to be the monthly amount before System/34 explains Peter Edwards The systems controller Margaret Terry maintains all the files and handles the run procedures She has written many Data File Utility (DFU) programs and says It's a piece of cake One such report enables her to pull out orders that are completed but not yet invoiced She also wrote a conversion program that allows her to take all the bureau files onto the system

There is now much less paperwork for everyone Staff can key an order into the system directly against a customer number to see at a glance what credit limit is established with that customer As soon as a customer comes on the telephone with an order TEK obtains the necessary information

"Invoicing was done in batches on an erratic basis"

From the order information the system automatically generates the picking list delivery note invoice and statement As Margaret Terry says Using a computer is simply a question of discipline She currently produces about 1200 statements per run These are out within two days by the end of each month an improvement of some 10 working days

Transaction balancing is now run daily instead of monthly A central ledger for the three companies is updated at head office from locally held information Invoices are received by post and keyed into the system for processing and printing

In the old days everybody blamed the computer because it was some remote beast in the DP department but nowadays with the desk top screens staff at all levels can access data says Peter Edwards A visual display unit and a matrix printer are installed in the two depots but shortly these will be connected via telephone lines to the System/34 which has just been upgraded to include the Interactive Communications Feature (ICF) When this is operational the depots will maintain their own order entry information and will print their own invoices sending only end of day procedures to System/34 every evening

Peter Edwards says that System/34 has brought other benefits to TEK There was clearly a need to rationalise the product line to maintain our high service level he recalls As soon as we had ordered the DMAS II order entry and invoicing program the board of directors realised the time was right to put the store in order TEK concentrated on the three main categories of product hose machinery and conveyor belting This enabled us to create greater stock availability for our customers and by having fewer categories we have realised a 15% inventory reduction and improved our purchasing stock to the value of £170 000 per month Stock in the company's 18 000 sq ft West Bromwich warehouse generally stands at £1½ million at any one time Before System/34 remembers Margaret Terry we had over 11 000 items on the stock files We have gradually pruned this to the current level of 800

For the first time TEK has been able to produce a combined product catalogue and price list where customers can now order required quantities and lengths against simple product codes We now have just 60 product lines in the base catalogue Discounts offered to a customer are based on the amount of business he agrees to place with us The customer therefore knows exactly where he stands TEK now estimate that they have been able to improve their service level by 10%

Through System/34 I can now predict crises and take remedial action before the crisis can happen

Within the TEK Group there are some 2500 accounts of which over 1500 are 'live' (orders within the last six months) Armed with this information sales staff can concentrate on key customers Before we had the computer my sales staff used to get one order in ten field calls now it's one in five *telephone* calls That's surely a fantastic increase in sales productivity!"

The system will also produce reports to assist in planning profitable delivery routes and telemarketing by area This too has enabled us to improve our service level Our telemarketing operators will call customers to let them know when a delivery vehicle will be in the area and knowing this customers will frequently place fresh orders with us

If everything goes according to plan TEK will hit a turnover of £2½ million this year – unforeseeable three years ago TEK is now waiting for the DMAS II Purchasing package When it is installed in September 1980 they will be able to pull together the back order file item file and stock replenishment

Peter Edwards sees the computer as all embracing and says it has to be controlled at the highest level by management who must be willing to play an integral and continuing role to take key decisions both before and after it is installed IBM has a wide spectrum of sophisticated products in the small business market and a wide range of office products to meet every kind of user need from the smallest to the largest company Peter Edwards says no one can afford to be complacent in business these days Therefore the British businessman should seriously consider computerisation – otherwise the competition will put one over on him For a company our size we have now got a lead of 12 to 18 months over our competitors in the distribution business he says with a smile ■

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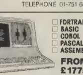

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"Computers for the Businessman" See page 34

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Schools

As a member at a public boys school which is about to introduce compulsory computer studies into the syllabus in the immediate future I feel that in view of your magazine's interest in educational computing, many people will now be aware of the new opportunities that this venture will open for the members of the school.

Our school has had a computer since about 1971 and dismantled the previous one eighteen months ago to make way for a new Texas Instruments computer which provided four terminals and had a floppy disc unit. At present the computer is being expanded to accept a further ten terminals so that two or three times a week one boy in a form of twenty eight can have the use of his terminal for half of a forty minute lesson.

The only reason that our school is in such a fortunate position is that the school's foundation committee was prepared to fund the purchase of the computer because they recognised the need of a computer to teach a subject which is likely to shape the society which its pupils will inherit.

Boys will have the option to do an O level in computing and could go on to do an A level. The compulsory lessons start for boys in the 14/15 age bracket and go on for one or two years. Clearly I and the other 845 pupils of our school are extremely privileged to have such an opportunity of learning about such an important subject as computing. I only hope that *Computer Age* will carry on providing such a valuable aid to my generation as well as it does for the present computer using generation, if not better.

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Refreshment

I find your magazine very refreshing in that it gives a good qualitative account of the computer scene which makes a very welcome change from the bombardment of quantitative information.

Ian R Dodd 55, Weavers Way, Dover, Kent CT16 2DD

The Helmsman

I was very impressed by the article on Cybernetics as published in your journal by M Saeed Sheikh. Not only has the author made the subject readable but also instructive with much of the mystery taken out of this interesting subject.

I am looking forward to the remainder of the articles.

R G Evens FMS Senior Work Study Officer, 23 Quaves Rod Slough Berkshire SL3 7NX

The Helmsman

I was very interested to read the series of articles by M Saeed Sheikh on cybernetics. As a Chartered Accountant I know how difficult it is to introduce new concepts and techniques which will be of use to today's managers working in a demanding environment. I must therefore congratulate Mr Sheikh on presenting this subject in a brief and readable form.

Cybernetics could be a valuable aid in understanding and improving control mechanisms within organisations and I look forward to reading the rest of the articles in this series.

Myan Manzur Mannan, 6 Elmwood Court, 38 Battersea Pk. Rd., London SW11 4HY

The Helmsman

The articles in *Computer Age* entitled The Helmsman Parts 1 & 2 introduce a new and stimulating subject. The author is very clear and systematic in his approach to a difficult science.

It is encouraging to see that the topic is opening up into practical applications (Issue 1, *Business Computing*) under the heading A basic framework. A very timely series of articles. I look forward to further editions.

J G Ardley (an industrial training advisor) 57 Vista Drive Redbridge Ilford Essex IG4 5JF

PROLOG

My attention was first drawn to your magazine among the vast selection of computer magazines that are available these days due to your articles concerning Artificial Intelligence. Having taken two Machine Intelligence courses at University only to find an apparent lack of interest in the subject by the majority of magazines at that stage it was refreshing to see a new magazine take up the challenge of reporting topics relating to AI.

I should imagine that most readers found the articles by Mike Fairhurst extremely interesting and hopefully these articles will encourage further reading as the topics covered are obviously only scratching the surface of the research that has been and is being carried out in AI. One common fault though with any article on AI is the apparent lack of connectivity between the wide range of topics covered ie how can say Strategy Planning Speech Vision Nerve Nets Developmental Psychology Predicate Calculus (and thereafter PROLOG) etc be connected to represent a common aim? This is a difficult question to answer and is perhaps unanswerable at present but it would be interesting to know the views of eminent people.

I became even more interested in your magazine when I picked up issue 8 and found that you were to report on PROLOG. My third year project at University concerned the use of PROLOG and during the early stages of this project I found it extremely difficult to gather any literature on the language. PROLOG is an extremely elegant and easy to use language. It allows the user to program in very near to readable English and therefore could particularly appeal to the field of education especially at primary and secondary levels due to the ease of programming and its interactive nature. The only reservation I have about Bob Welham's article having read earlier reports of his is that we will only be shown geometry problem solvers and other mathematical problem solvers rather than more general and transparent topics/programs. I have included a PROLOG program which I found very useful in grasping the fundamentals of the language this program deals with family relationships. Transparent programs may be considered too easy by most people but we need transparency before we can conquer complexity. Hopefully the two can exist together.

I am now looking forward to even more interesting AI articles to maintain the standard you have set yourself!

I Whitehead 26 Olivers Crescent Great Wakering, Essex SS3 0ES

The PROLOG program will appear in a future issue

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